AN FORAS TALÚNTAIS

HORTICULTURE AND FORESTRY DIVISION

RESEARCH REPORT 1961

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20 FEB 1963

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AN FORAS TALÚNTAIS

(THE AGRICULTURAL INSTITUTE)

HORTICULTURE AND FORESTRY
DIVISION

RESEARCH REPORT, 1961

Published by An Foras Talúntais, 33 Merrion Road, Dublin 4.

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TO THE CHAIRMAN AND COUNCIL OF AN FORAS TALÚNTAIS

I have the honour to present to you this second series of Research Reports (one for each of the five Divisions) covering the research programme of An Foras Talúntais.

It is possible to report considerable progress in the year under review and in evaluating this progress the two series of reports should be taken together. I know you will understand that, as many of the experiments are of a long term nature and that year to year climatic variations must also be taken into account, conclusive results are not yet available for many facets of the work in progress. However, we feel that the data already available and summarised in these reports may be of value to persons engaged in providing advisory services in relation to agriculture and to research workers interested in the several fields to which the reports relate. As the different experimental projects are completed reports will be presented in scientific publications and in technical bulletins. Since our first series of reports a considerable volume of work has in fact been so published.

In presenting this series of reports we wish to gratefully acknowledge the assistance received from the Minister for Agriculture and the staff of the Department of Agriculture; the University authorities; Comhlucht Siúicre Eireann Teó., the advisory services and the various rural organisations. We have also been greatly helped by the support and co-operation of many organisations and research workers from outside the country.

T. WALSH.
Director.

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INTRODUCTION

In this, the second research report, a brief account is given of the work carried out by the staff of the Division during the past year.

There are three main centres where the work is carried out. Of these, the Vegetable and Glasshouse Crops Research Centre, Kinsealy, is located in close proximity to the market gardening area of north Co. Dublin. Here trials on varieties of vegetable and glasshouse crops, on cultural methods under glass, on weed and pest control problems manuring, mushroom culture, and other aspects of vegetable production are proceeding. The work is being extended to cover commercial flower production under glass and in the open. Additional work on vegetables by the staff of the Division is proceeding at the Lullymore, Co. Kildare, centre of the Institute, to investigate the production of horticultural crops on peatland after removal of the upper layers for industrial purposes. Here also trials on mushroom culture are carried out on an extensive scale. Vegetable trials with special attention to the needs of the processing industry are in progress at the Oakpark centre.

Work on soft fruits is mainly carried out at the Soft Fruit Research Centre, Clonroche, Co. Wexford, where variety, cultural, and manurial trials are in progress, with work also on disease and pest control. Trials on some special fruit crops of possible economic value are in progress at Johnstown Castle. Bee-keeping research is carried on at both centres.

The Pomology Research Centre is located near Dungarvan, Co. Waterford, where research on the growing of orchard fruits is being developed, including variety, rootstock, cultural and manurial trials, and hop growing. Control of pests and diseases is investigated, with special attention to apple scab disease. In connection with the latter a warning system has been developed to aid growers in timing the application of sprays for the control of this disease.

A specialist advisory service for soil fertility problems is also operated from the soil laboratories at Johnstown

Castle, Wexford, in co-operation with the staff of the Soils Division.

J. G. D. Lamb.

ONION SET VARIETY TRIAL

A further trial to assess the relative merits of the commercially available varieties of onion sets was carried cut in 1961. All varieties were imported , size 8–22 mm, and had been heat treated. Results (Table I) followed similar lines to those obtained in 1959, 1960. The variety Ardri again exhibited a very high bolting tendency. Rijnsburger and Giant Zittau were latest to ripen with Rijnsburger giving large bulbs of excellent globe shape. The flat bulbed Stuttgarter again showed its general freedom from bolting.

TABLE I

Variety	Mean Marketable Yield of 4 plots lb.	Average weight per bulb oz.	% Bolters
Rijnsburger	80.19	4.82	3.36
Stuttgarter	73.85	3.81	0.46
Ardri	32.31	3.55	44.77
Giant Zittau	74.64	4.41	2.79

Significant Difference: P 0.05=14.69 lb./plot
P 0.01=21.13 „ „

Conclusions that may be drawn from the results of 3 years' trials with onion set varieties:

(a) Ardri because of its high bolting tendency and poor keeping qualities is not a very satisfactory variety under Irish conditions. That it is the earliest variety to mature scarcely offsets these important disadvantages.

(b) Stuttgarter has an important role to play where onions are grown for sale early in the season (July). Sets of this variety are available generally from January onwards and thus can be planted very early. Because of its inherent resistance to bolting, heat treatment is not usually given to this variety.

(c) Rijnsburger gives high yields of fine globe shaped bulbs of fair keeping quality and has a slight advan-

tage over Giant Zittau because of its more desirable market shape. Both these varieties are not available until March since they require heat treatment. Bolting rate can be very high in untreated sets.

J. C. Cassidy.

OBSERVATION TRIAL ON ONION SET PRODUCTION

In this trial seed rates of 90, 100 and 120 lb/acre were compared. The establishment and density of sets were adequate at all rates and little difference was noted. Sowings were made on three dates. The earlier sowings, April 1 and 18, gave comparable results and had reached suitable set size by the 3rd week of July. The final sowing made on May 8 was more than three weeks later in reaching set size. This sowing had heavier foliage and a greater tendency for elongated bulbs with thick necks. The variety used in all cases was Rijnsburger (Grobel strain) and sowing was carried out with a combine corn drill giving 7 inch row spacings. Under the conditions of this trial the combine corn drill proved quite satisfactory. After pulling, the sets were left in the field for 2—3 weeks; then they were artificially dried, cleaned and graded. On November 22 they were placed in a storage chamber for heat treatment at 80 F and a relative humidity of 80. This treatment will continue until March. The area under trial comprised in all $\frac{1}{4}$ acre and the yield of onion sets harvested was :

	cwt.	qr.	lb.
Under 8 mm.=	2	0	0
8—15 mm.=	18	2	9
15—22 mm.=	16	2	12
over 22 mm.=	5	1	0

J. C. Cassidy.

METHOD OF PLANTING ONION SETS

Trials carried out in 1959-60 indicated that the method of planting whereby sets were dropped in the drill and covered was quite promising, but that yields tended to be lower than where sets were placed. In 1961 two trials were carried out to investigate further the relative merit

TABLE II (TRIAL I)

METHOD	Mean Yield of 4 plots tons/ acre	Average wt. (g) of sets planted per plot	Average no. of sets planted per plot
Placed and spaced	22.24	509	193
Placed, spaced and covered in 1½″ deep drill	23.86	520	199
,, ,, ,, ,, ,, 3″ ,, ,,	23.60	534	192
Dropped ,, ,, ,, ,, 1½″ ,, ,,	21.64	466	182
,, ,, ,, ,, ,, 2¼″ ,, ,,	22.51	458	188
,, ,, ,, ,, ,, 3″ ,, ,,	21.72	503	190

Significant diff. for mean of 4 plots P 0.05 = 3.65 tons/ac.
P 0.01 = 4.47 tons/ac.

TABLE III (TRIAL II)

METHOD	Mean of 4 plots tons/ac. 10-12 mm	12-14 mm	14-16 mm	16-18 mm	Mean of 16 plots	% Bolters	% Establishment
Placed and spaced	14.92	23.63	21.39	24.38	21.08	5.6	88.8
Placed, spaced and covered in 2¼″ deep drill	17.50	21.14	23.82	23.03	21.37	4.7	92.3
Dropped, spaced and covered in 2¼″ deep drill	18.23	17.80	21.57	21.70	19.83	1.3	87.3
Mean of 12 plots	16.88	20.86	22.66	23.04			

Significant diff. for mean of 12 plots (sizes) P 0.05 = 2.33 tons/ac.
P 0.01 = 3.14 tons/ac.
Significant diff. for mean of 16 plots (methods) P 0.05 = 1.70 tons/ac.
P 0.01 = 2.46 tons/ac.

of the different methods. Results of these trials showed that where sets of the same size and number or a definite weight for a given area were planted no significant difference resulted from any of the three methods compared. The low yields and poor establishment obtained with the dropped method in previous years may be attributed to the fact that planters working with commercial sets, size 8—22 mm. tend to select large sound sets when placing as each set requires individual handling whereas with the dropped method no selection is made; a handful of sets being taken and dropped irrespective of whether these sets are small, diseased or otherwise. As shown in the trial on size of set, a greater proportion of larger sized sets in the placed methods would have a big influence on final yield.

Sets were dropped and covered at 3 depths: $1\frac{1}{2}$, $2\frac{1}{4}$ and 3 inches. No significant difference in yield or establishment was noted between the different depths. The results would indicate that there is much to recommend the dropped and covered method; the saving in planting costs being an important consideration since this method is $2\frac{1}{2}$ times faster than placing. Also, where sets are placed and not covered it is often necessary to replant the numerous sets which are pulled or pushed out of the soil through bird and worm activities. This does not happen where sets are dropped and covered, and as in the 1960 trial the number of bolters was least with this method. In both trials (Tables II and III) under the different systems, a standard spacing of 2 inches apart was the aim in order to give a comparable number of sets in each plot. The variety Rijnsburger was used at a row spacing of 16 inches.

J. C. Cassidy.

CONTROL OF WEEDS IN ONION SETS

The following treatments were used on the onion sets of the variety Ardri, size 8—22 mm.

1. CIPC (40 percent) @ 6 pints/ac.
2. 3 parts CIPC + 1 part diuron @ 4 pints/ac.
3. OMU (16.5 percent) + BIPC (11.5 percent) @ 3 pints/ac.
4. 2, 6 Dichlorobenzonitril (50 per cent) @ 8 lb/ac.
5. Control.

All treatments were applied 3 days after planting (10/4) in 100 gallons water per acre. On June 21 all plots were sampled and weed counts and weights recorded. Following sampling all plots were hoed and hand weeded and the times taken to carry out these operations were noted. The most prevalent weed in the trial was fumitory. CIPC gave good control of this species and in general gave the best all round control of weeds. There was little to choose between the other herbicides but Treatment 3 gave poor control of fumitory. As the results show, (Table IV), all herbicides gave significantly increased yields when compared with the control. Slight chlorosis of the onion plants was evident in the early stages with Treatment 2 but this condition disappeared 2—3 weeks after spraying.

TABLE IV

Treatments	Mean Yield of 4 plots, tons/ acre.	Time taken to weed average of 3 plots	Average weight of weeds in g/sq. ft.
1	13.33	6.6 mins.	42.6
2	11.41	8.3 „	60.0
3	11.70	11.0 „	94.8
4	11.94	8.3 „	92.3
5	6.61	20.0 „	160.8

Significant difference mean of 4 plots P 0.05=2.46 ton/ac.
P 0.01=3.45 „ „

J. C. Cassidy.

ONION SETS : EFFECT OF SIZE

The work commenced in 1960 on the effect of set size on yield and bolting was continued in 1961. No home raised sets being available, treated imported sets of 4 varieties were used. In order to gain more precise information on set size, sets were graded to closer ranges giving a total of 7 sizes. Results are in close agreement with those obtained in the previous year and are set out in Table V. In general, as set size increased, total yield,

TABLE V

Onion Sets : Effect of size.

SIZES	RIJNSBURGER			STUTTGARTER			ARDRI			GIANT ZITTAU				
	Mean Marketable Yield 4 plots Tons/ac.	Mean wt. per bulb 4 plots oz.	% age Bolters	Mean Marketable Yield 4 plots Tons/ac.	Mean wt. per bulb 4 plots oz.	% age Bolters	Mean Marketable Yield 4 plots Tons/ac.	Mean wt per bulb 4 plots oz.	% age Bolters	Mean Marketable Yield 4 plots Tons/ac.	Mean wt per bulb 4 plots oz.	% age Bolters	Mean Yield of 16 plots tons/ac	Mean Weight per bulb 16 plots oz.
8-10 mm	13.30	3.32	0.7	11.42	2.42	Nil	7.40	2.42	35.0	13.63	2.94	2.3	11.44	2.78
10-12 mm	15.66	3.82	2.5	15:55	3.05	Nil	6.08	2.52	53.3	13.77	3.05	4.5	12.77	3.11
12-14 mm	18.26	4.23	3.0	15.64	3.05	Nil	5.11	3.49	69.5	17.15	3.50	5.6	14.04	3.57
14-16 mm	18.64	4.24	10.0	18.93	3.55	Nil	4.68	3.41	76.1	16.92	3.39	10.2	14.75	3.65
16-18 mm	20.11	4.56	9.8	20.65	3.76	Nil	5.18	4.27	68.1	19.54	4.08	10.2	16.38	4.17
18-20 mm	20.48	5.21	19.6	19.40	3.72	2.1	4.84	4.44	74.7	19.58	5.11	18.4	16.33	4.82
20-22 mm	19.61	5.57	21.7	24.65	4.71	1.0	4.00	3.55	72.1	17.75	5.77	20.5	16.50	4.88
Mean of 28 plots	18.01	4.42		18.03	3.45		5.33	3.44		16.91	3.96			

Sig. difference for mean of 16 plots P 0.05 = 1.67 tons/ac and 0.43 oz./bulb

" " " " " " P 0.01 = 2.41 " " 0.56 "

" " " " " 28 " P 0.05 = 1.65 " " 0.70 "

" " " " " " P 0.01 = 2.37 " " 1.00 "

" " " " " 4 " P 0.05 = 2.35 " " 0.86 "

" " " " " " P 0.01 = 4.81 " " 1.13 "

bolting rate and average bulb weight increased progressively. However, with the largest size of set (20—22 mm.) total yield of marketable bulbs was reduced with all varieties, except Stuttgarter, because of the greater number of bolters. Ardri was exceptionally prone to bolting even at the smallest set size (8—10mm.). Establishment was good with all varieties and sizes. The smaller set sizes tended to have the lowest rate of establishment. Rijnsburger was slower to start growth and, also, had the lowest rate of establishment.

J. C. Cassidy.

ONION SETS : EFECT OF SIZE AND SPACING

Spacings of 1, 2, 3 and 4 inches within the row were compared using 7 set sizes of the variety Rijnsburger. Indications from this trial were:—

(a) Set sizes were an important factor in the final yield, no matter what spacing was used. The larger size yield, it is doubtful if it can be regarded as a practicable proposition when the greater number of sets required and increased planting costs are taken into account. Also at the closer spacing bulbs tended to be mis-shapen and small in size.

(c) Rate of bolting was slightly increased with closer spacing.

(d) With onions grown for processing, where peeling sets gave the higher returns.

(b) Even though the 1 inch spacing gave the highest is a factor of some importance, a 4 inch spacing giving large bulbs would appear to have an application.

(e) For general use however 2 inch spacings appear best.

Results are shown in Table VI.

J. C. Cassidy.

TABLE VI

Onion Sets : Effect of size and spacing.

SIZES	1 inch spacing		2 inch spacing		3 inch spacing		4 inch spacing			
	Mean Yields of 4 plots lb./plot	Mean Wt. per bulb 4 plots oz.	Mean Yields of 4 plots lb. plot	Mean Wt. per bulb 4 plots oz	Mean Yields of 4 plots lb plot	Mean Wt per bulb 4 plots oz	Mean Yields of 4 plots lb plot	Mean Wt per bulb 4 plots oz	Mean Yield of 16 plots lb plot	Mean Wt per bulb 16 plots in oz.
8-10 mm	10.22	2.52	10.03	4.70	7.20	5.65	6.23	5.86	8.42	4.68
10-12 mm	13.17	2.69	10.33	4.39	8.62	5.60	8.41	7.47	10.13	5.04
12-14 mm	12.92	2.75	11.02	4.64	10.11	6.58	7.12	8.21	10.29	5.55
14-16 mm	15.56	3.38	12.07	5.16	11.32	7.17	9.65	7.68	12.15	5.85
16-18 mm	14.23	3.29	11.74	5.97	10.52	6.70	10.30	8.78	11.70	6.19
18-20 mm	13.53	3.17	12.37	5.99	12.18	7.76	10.03	8.99	12.03	6.48
20-22 mm	11.97	3.05	12.31	6.23	10.59	7.93	10.31	10.30	11.30	6.88
Mean of 28 plots	13.09	2.88	11.41	5.30	10.09	6.77	8.86	8.18		

Sig. difference for means of 16 plots P 0.05 = 1.38 lb/plot and 0.68 oz/bulb

P 0.01 = 1.84 " " 0.91 "

" " " " " 28 " P 0.05 = 1.00 " " 0.48 "

P 0.01 = 1.43 " " 0.70 "

" " " " " 4 " P 0.05 = 2.78 " " 1.36 "

P 0.01 = 3.70 " " 1.81 "

EARLY SUMMER LETTUCE VARIETY TRIAL

Twelve varieties were sown in the open at Kinsealy on April 15. Cutting commenced on all varieties between June 20 and 27 and the return of marketable heads ranged from as high as 98.1 percent in the case of Borough Wonder (Dardis & Dunn) to 80.2 percent. This variety finished well with very little marginal leaf scorch which tended to be prevalent amongst many of the varieties in the trial. The variety Attractie also provided good quality heads up to the final cutting, 87 percent of which were marketable. Cobham Green provided a good crop of dark green compact heads with 94 percent marketable, while May Princess, though it produced tender heads with very little marginal leaf scorch, they were inclined to be very soft with 48.5 percent in second grade.

O. G. Goodman.

SPINACH VARIETY TRIAL

This was a general observational trial on spinach varieties for the fresh vegetable trade. Twelve varieties were sown at Kinsealy on May 23 in rows 18 in. apart and thinned to 6 in. spacing. The results showed distinct differences in the foliage colour and rate of bolting of the different varieties. Varieties with light green foliage were Blatchford's New Prickly (Clucas), Blatchford's New Round (Clucas), Broad Leaf (Clucas), L.S.D. (Speed), Mildew Resistant Prickly (Sluis), Heimalis (Sluis). Those with the darkest green foliage were King Round (Harrison), Norman Viking (Speed), Estiva (Sluis). The varieties Noorman (Harrison), Mildew Resistant Prickly (Sluis) and Hiemalis (Sluis) were most prone to early bolting while No. 23 (Elsom), Norman Viking (Speed) and Estiva (Sluis) were slowest to show flower heads. The later varieties were dark in colour and the early maturing varieties light green.

O. G. Goodman.

PARSLEY VARIETY TRIAL

Forty nine varieties were grown at Oakpark with the intention of selecting the variety most suitable for pro-

cessing (drying). Both plain leaved and the more usual curled types were used. The factory yield of the plain leaved varieties tended to be lower than the curled leaf types due to higher proportion of stems in the former, and since the plain leaf types seem to have no special advantages from the processors' point of view it is unlikely that they will be tried further.

Of the curled leaf types differences showed up in the foliage colour and in their growth rate, though most varieties eventually produced a good crop. Yields up to 8 tons per acre were recorded, and 6 tons per acre was common. Only one cutting was taken, but results indicated that at least a second could be expected with proper manuring and by regulating sowing date.

While a number of the more promising varieties was selected for further test it was considered that information was more urgently required on the proper spacing of the crop for mechanical harvesting.

O. G. Goodman.

ASPARAGUS

Twenty varieties sown in the spring, 1959, are to be planted during the coming year with a view to selecting the best plants which will be used for further propagation and selection.

O. G. Goodman.

BEET VARIETY TRIAL

Fifty two varieties were grown at Kinsealy and Oakpark. These included long, round and cylindrical types. Most improvement seems to have been achieved in the round types which contained some of the best quality varieties, and even here none of the varieties grown were completely free from undesirable characters such as pale concentric rings. It is hoped to grow some of the better varieties at a later stage with the aim of selecting roots best suited to processing and the fresh vegetable trade. Other varieties will be added to the trial.

O. G. Goodman.

CARROT VARIETY TRIAL

One hundred and twenty one varieties of carrots were grown at Kinsealy to study a cross section of the material available with a view to selecting varieties suitable for fresh market and for processing. Most of the varieties observed were mediocre in external and internal quality and approximately eight percent of the varieties had very poor internal quality. No variety could be said to be up to the standards required though amongst a number of varieties were some excellent roots. Seventeen varieties were selected for further trials as large carrots and sixteen varieties were selected for further trial as small carrots.

O. G. Goodman.

CELERIAC VARIETY TRIAL

Three varieties were grown at Kinsealy and twenty eight were grown at Oakpark with the intention of selecting varieties most suited to the processors' requirements. Those grown at Oakpark were a failure while the varieties grown at Kinsealy all made excellent growth throughout the season. However, the factory yield of all varieties was unsatisfactory.

O. G. Goodman.

SELF BLANCHING CELERY VARIETY TRIAL

Twelve varieties grown at Kinsealy were compared, five of which have been retained for further trial. Yield of marketable produce was affected by internal browning of the leaf stalks which varied in severity from 0.4 percent in the case of Golden Self-blanching (Van den Berg) to 28.5 percent in the case of Golden Plume. The amount of Heart Rot also varied widely from one variety to another, Golden Plume being most seriously affected here also.

O. G. Goodman.

PEA VARIETY TRIAL

Eighty seven varieties of peas were sown at Oakpark on May 5, earlier sowing being impossible due to continuous wet weather during April. The aim was to select varieties suitable for processing at a tenderometer reading of 100.

A second sowing of these varieties, made on June 5 to see the effect of late sowing, gave yields ranging from one to two tons per acre indicating that reasonable yields are possible even at this late sowing date. In all, eighteen varieties were selected for further trial.

O. G. Goodman.

DWARF FRENCH BEAN VARIETY TRIAL

Trials were conducted at Oakpark and Kinsealy with eighty eight varieties of French Beans with a view to selecting those most suitable for processing. Many of those in the trial lacked the quality or uniformity of ripening desirable in processing crops. Though the crop did not make very good progress, due mainly to nutritional problems, it was possible to select twenty four varieties for further trial during 1962.

O. G. Goodman.

SPRING CAULIFLOWER VARIETY TRIAL

Fifteen varieties sown on October 15 at Kinsealy were planted in a replicated trial on March 6. The earliest variety was Early Snowball (Elsom), followed by White Leader (Rowan), Snowdrift Improved (Clucas), Cantab (Harrison) and Pinchbeck Favourite (Elsom). Of these White Leader (Rowan) gave the highest proportion (93.4 percent) of marketable curds. The later varieties Early Superb (Rowan) and Spartan White (Rowan) both gave higher percentages of marketable curds, the former being a few days later and the latter up to a week later in maturing than the above varieties. All The Year Round (Harrison) gave the highest percentage of marketable curds in the trial but it was also the latest to mature being 3 to 4 weeks later than Early Snowball.

O. G. Goodman.

SUMMER AND AUTUMN CAULIFLOWER VARIETY TRIAL

One hundred and seven varieties of summer and autumn cauliflowers were sown at Oakpark and Kinsealy on April

27 and again on May 26 to observe the range of types available, their degree of uniformity and as a preliminary trial in the attempt to select or develop varieties most suitable for the processing and fresh market trades. Premature hearting (buttoning) was prevalent in some of the earlier varieties, and in a general way it could be said that those varieties were also most subject to molybdenum deficiency which was very severe in some cases.

It was noticeable that a number of varieties of All The Year Round type were amongst the least subject to molybdenum deficiency and premature ripening and when sown late enough gave curds of good size up to the end of November which were of better quality than many of the normally grown autumn types. A selection of the best varieties of the types referred to are to be grown during the coming season and one of them will be sown on a number of different dates in an effort to establish how late they can be expected to produce satisfactory crops.

O. G. Goodman.

WINTER CAULIFLOWER VARIETY TRIAL

Sixty five varieties of winter cauliflower were sown at Oakpark on April 28 and again on May 26 to select hardy varieties most suited to processing and to the fresh market. The severe weather in late December provided a good opportunity for selection on the basis of hardiness. While there were obvious differences between the reaction of varieties to the cold conditions it was noticeable that those nearest maturity tended to be most vulnerable.

Assessment of the various varieties is being made from which it is hoped to select a small number for further trial.

O. G. Goodman.

SPRING CABBAGE VARIETY TRIAL

Ninety five varieties of spring cabbage were sown at Kinsealy on July 22 and planted on September 27 with a view to selecting early maturing varieties both as hearted cabbage and for greens. A second sowing of these varieties was made on August 10 and planted on February 20. Observations are continuing.

O. G. Goodman.

SUMMER AND AUTUMN CABBAGE VARIETY TRIAL

Seventy varieties of summer and autumn cabbage were sown at Kinsealy and Oakpark on April 27 and again on May 29. Approximately 150 plants from each variety were planted on June 23 and July 21 respectively. Records were kept of the main external morphological characteristics, time of maturity, head size, quality and yield. Samples were sent for test processing.

One of the most interesting points of the trial was the high yield of good quality heads produced by some autumn maturing types, four of which yielded over 30 tons per acre. Twelve of these varieties are to be subjected to a further trial with the aim of selecting the varieties most suitable for processing at this time of year.

O. G. Goodman.

WINTER CABBAGE VARIETY TRIAL

This trial was conducted at Oakpark and Kinsealy with a view to selecting varieties of winter cabbage suitable for processing. In all, sixty eight varieties were grown. These included Christmas Drumhead, January King and Storage Cabbage as well as the Savoy types. All varieties were sown on April 28 and again on May 26. Full records were kept of the appearance, quality, time of maturity, and yield of all varieties. Samples were sent for test processing.

There is particular interest in varieties which are available for processing from January to March but nothing outstanding was noticed in the trials to suit this period due to variability in time of maturity and in the regularity and firmness of heads produced. Severe cold conditions in

December provided an opportunity to observe the reaction of the various varieties to frost.

A small number of varieties of each type was selected for further trial.

O. G. Goodman.

BRUSSELS SPROUTS VARIETY TRIAL

The varieties Jade Cross, Long Island (Ohlsens), Aristocrat (Unwin), Westland Favourite (Zwaan), Glasnevin Supreme (Rowan), Glasnevin 2/61 (UCD), Irish Elegance (UCD), Ashwells Strain (Clucas), Cambridge No. 1 (Dardis & Dunn) and Evesham Special (Harrison) were sown at Kinsealy on March 9 and planted on May 27 in a replicated trial to compare them as varieties for market sprout production.

The most striking feature of the trial was the uniformity of performance of the F_1 hybrid Jade Cross when compared with the other varieties in the trial. As a market variety it is useful early in the season in spite of certain shortcomings. For later crops Irish Elegance is dependable though not as high yielding as varieties like Westland Favourite which gave over 6 tons per acre of marketable sprouts, compared with 4—5 tons for Irish Elegance. However, Westland Favourite is of lower quality.

O. G. Goodman.

FREEZER SPROUT VARIETY TRIAL

The trial included Marche de Berne (Falter), Sanda Cambridge Special (Tozer), Perfection Freezer (Hurst), Glasnevin 47/60 (UCD), Race de Rosny (Vilmorin)' and Irish Glacier (UCD). They were sown at Kinsealy on March 9 and planted in a replicated trial on May 30.

The varieties Race de Rosny, Marche de Berne and Glasnevin 47/60 all gave over six tons per acre of total yield, but the latter gave the maximum yield of freezing size sprouts at 86 cwt. per acre. Irish Glacier gave the lowest over-all yield per acre but the highest percentage of suitably sized sprouts and as a consequence the second highest yield of freezing sprouts in the trial. The third highest yielding variety as regards small sprouts was Race

de Rosny even though it had 26.6 percent of the crop unfit for freezing. Though the variety Sanda had the second highest proportion of suitably sized sprouts, the actual yield of small sized sprouts was only equal to that of Perfection Freezer, the second lowest in the trial.

O. G. Goodman.

CALABRESE VARIETY TRIAL

Because of the interest in this crop for freezing it was decided to compare fifteen varieties. These were sown at Kinsealy on May 25 and planted on July 13. Cutting of the crop commenced on August 29. Italian Sprouting (Drummond), Calabrese (Hurst), Green Sprouting (Clucas), Italian Sprouting (Sutton) all gave over 2.5 tons per acre. This figure includes the central head.

The results indicated the desirability of obtaining varieties which would give a greater proportion of the crop in the form of side shoots and where the central head would be capable of being divided into small units. The more promising of the varieties tried are to be tested during the coming season with a view to further selection.

O. G. Goodman.

SWEET CORN VARIETY TRIAL

Eleven varieties were sown at Kinsealy in May to assess their performance under our climatic conditions and to determine the feasibility of encouraging the production of this crop for processing and for the fresh vegetable trade. Serious bird damage at an early stage necessitated the abandonment of the experiment.

O. G. Goodman.

SEED ONION VARIETY TRIAL

Fifteen varieties were sown at Kinsealy on March 21. The varieties Main Crop (Elsom), Golden Globe (Brown), and Weibulls Hybrid gave the heaviest yields, of up to 11 tons per acre. At harvest time samples were checked for dry matter content. This was found to range from 7 to 14 percent, and is an important factor where the crop is

required for processing to a dry product. The variety Main Crop had dry matter of 12.2 percent.

The keeping qualities of the varieties showed a wide variation from 87.8 perecent of sound onions in the case of Main Crop (Elsom) to 5.2 percent in the case of Lancastrian. These were the figures recorded on January 16, the bulbs having been stored under natural conditions.

O. G. Goodman.

HYBRID ONION VARIETY TRIAL

Seed of two hybrids developed at University College, Dublin, were sown at Kinsealy on August 30 and planted on October 18. Three other commercial varieties were sown at the same time for comparison. It is hoped to study their progress during the coming season.

O. G. Goodman.

RHUBARB VARIETY TRIAL

Forty varieties of rhubarb were planted at Kinsealy on March 3, 1962. This plantation will act both as a collection and as a trial to observe the performance of the different varieties in the open and later on for forcing and processing.

O. G. Goodman.

MANURING OF BRUSSELS SPROUTS 1960

The variety used was Glasnevin Supreme. The trial, as in 1959, was conducted on an alkaline soil (pH 7.6) with low available levels of phosphorus and potassium. The following fertilisers were applied in all possible combinations with, and without, farmyard manure at 20 tons/acre.

Sulphate of ammonia (21% N) applied at 0, 1½, 3 cwt./acre.
Superphosphate (8% P) applied at 0, 3, 6 cwt./acre.
Muriate of potash (42% K) applied at 0, 3, 6 cwt./acre.

As in the 1959 trial FYM significantly increased yields.

Sulphate of ammonia at 1½ cwt/acre when applied with FYM significantly increased yield with a further increase at 3 cwt/acre. In the absence of FYM, 3 cwt/acre sulphate of ammonia gave a significantly greater yield than either the control or 1½ cwt/acre.

Superphosphate when applied with FYM did not significantly influence yields. In the absence of FYM both 3 and 6 cwt/acre superphosphate significantly increased yields. However, there was no difference between the 3 and 6 cwt. treatments.

Though no significant increase in yield could be detected from the application of muriate of potash there were indications that when given at 3 cwt/acre without FYM plant vigour and yield were better than where no potassium was applied.

The results are shown in Table I.

TABLE I

FERTILISERS		Mean yield and number of plots			
		With FYM		Without FYM	
		Tons/acre	No. of Plots	Tons/acre	No. of Plots
Sulphate of ammonia	0 cwt/acre	2.70	27	2.49	27
	1½ „ „	3.08	27	2.64	27
	3 „ „	3.19	27	2.85	27
Super-phosphate	0 „ „	3.03	27	2.46	27
	3 „ „	3.04	27	2.79	27
	6 „ „	2.90	27	2.72	27

Standard error of a mean of 27 plots (with FYM) .074 ton
(without FYM) .082 ton

The marketable yield of sprouts was graded into three sizes (a) 1½″ diameter, (b) 1″–1½″ diameter, (c) ½″–1″ diameter. The results indicated that with FYM, 2.6, 46.5 and 50.9 percent of the total marketable yield were in grade a, b, c respectively. Where FYM was omitted the corresponding values were 1.5, 41.0 and 57.5 The results also indicated that with this variety the rate of application of nitrogen could be increased without danger of producing loose, or very large sprouts.

P. MacGiolla Ri.

MANURING OF BRUSSELS SPROUTS 1961

The treatments were similar to those applied in 1960, and are shown in Table II.

TABLE II

Mean yield and number of plots

Sulphate of Ammonia	With FYM		Without FYM		Mean	
Cwt./acre	Ton/ac.	No. of Plots	Ton/ac.	No. of Plots	Ton/ac.	No. of Plots
0	3.88	27	3.50	27	3.64	54
2	4.15	27	3.81	27	3.98	54
4	4.00	27	3.75	27	3.88	54
Mean	4.01	81	3.69	81		

Super-phosphate	With FYM		Without FYM		Mean	
Cwt./acre	Ton/ac.	No. of Plots	Ton/ac.	No. of Plots	Ton/ac.	No. of Plots
0	3.81	27	3.63	27	3.72	54
3	4.15	27	3.85	27	4.00	54
6	4.07	27	3.60	27	3.83	54
Mean	4.01	81	3.69	81		

Standard Error of a mean of 81 plots .048 ton
54 plots .059 ton
27 plots .072 ton

The result for the three years 1959, 1960, 1961 indicate that sprouts respond significantly to a basal dressing of FYM. On the Kinsealy soil the responses to phosphorus and nitrogen were significant in all years thus indicating that the crop is relatively sensitive to these nutrients. In comparison to carrots, onion sets, French beans and red beet, sprouts were relatively insensitive to potassium. Where sprouts grew satisfactorily onion sets and French beans suffered from severe potassium deficiency.

P. Mac Giolla Rí.

MANURING OF CARROTS (MAIN CROP)

The variety used was Chantenay. The soil conditions

and treatments were similar to those for Brussels sprouts but in this case sulphate of potash was used. This year FYM gave an overall increase of 32 per cent in yield of marketable roots. Of the fertilisers applied only sulphate of potash gave a significantly increased yield.

Yields are given in Table III. Sulphate of potash at 3 cwt./acre gave a significant increase in yield with further increase at 6 cwt./acre, both with and without FYM.

TABLE III

Mean yield and number of plots

Sulphate of Potash	With FYM		Without FYM		Mean	
Cwt./acre	Ton/ac.	No. of Plots	Ton/ac.	No. of Plots	Ton/ac.	No. of Plots
0	12.15	27	8.14	27	10.15	54
3	13.28	27	10.08	27	11.68	54
6	14.40	27	11.76	27	13.08	54
Mean	13.21	81	10.00	27		

Standard Error of a mean of 81 plots 0.69 ton
54 plots 0.30 ton
27 plots 0.43 ton

P. Mac Giolla Ri.

MANURING OF ONION SETS

The variety used was Rijnsburger (heat treated). Treatments and soil conditions were as outlined above for Brussels sprouts except that sulphate of potash was used.

Plant establishment and growth were very satisfactory for the first six weeks, but at this stage it was observed that the plants in the no FYM plots were falling off in growth relative to those in the FYM plots. In mid-June definite tip die back symptoms were observed on the foliage of the plants grown in the no potassium plots. Chemical analysis of plant samples confirmed that the symptoms were due to deficiency of potassium.

Significant increases in yield were obtained from FYM, and from potassium as shown in Table IV.

There was a significant FYM/potassium interaction. The maximum yield was obtained from the FYM × 3 cwt/acre sulphate of potash combination. Nitrogen/potassium interaction is shown in Table V.

TABLE IV

Mean yield tons/acre

Sulphate of Potash Cwt./acre	With FYM		Without FYM		Mean	
	Ton/ac.	No. of Plots	Ton/ac.	No. of Plots	Ton/ac.	No. of Plots
0	14.76	27	9.26	27	12.00	54
3	16.13	27	11.68	27	13.91	54
6	15.52	27	12.27	27	14.37	54
Mean	15.47	81	11.27	81		

Standard error of a mean of 81 plots 0.37 ton
54 plots .062 ton
27 plots .088 ton

TABLE V

Mean yield tons/acre

Sulphate of potash cwt./acre	Sulphate of ammonia cwt./acre		
	0	2	4
0	10.86	13.52	11.63
3	12.99	14.47	14.25
6	13.93	14.57	14.15

Standard error—nitrogen/potassium interaction—.34 ton.

The nitrogen potassium interaction would appear to be attributable to the low yield obtained from the no potassium —no nitrogen plots relative to the other combinations of nitrogen and potash.

P. Mac Giolla Ri.

MANURING OF RED BEET

The variety used was Crimson Globe. The soil conditions and treatments were similar to those outlined for Brussels sprouts. Contrary to the results in 1959 the FYM plots gave 20 percent greater yield than the no FYM plots.

Superphosphate significantly increased yields, with and without FYM. Where no FYM was given 3 cwt/acre superphosphate gave increased yields, with further increase from 6 cwt/acre, but in the presence of FYM no further increase was obtained from the 6 cwt. dressing.

The effects of muriate of potash dressings were similar to those of the superphosphate applications. There was also a significant superphosphate muriate of potash interaction, the best response being from the 6 cwt. superphosphate, 3 cwt. muriate of potash combination.

P. Mac Giolla Rí.

MANURING OF FRENCH BEANS

The variety used was Elsom's 839. Treatment and soil conditions were as outlined for Brussels sprouts. In this, the first year of the trial, FYM gave an overall increase in yield of 38 percent.

The crop appeared very sensitive to both potassium and phosphorus; potassium deficiency symptoms appeared in some plots towards the end of June and was confirmed by chemical analysis of plant samples. Both muriate of potash and superphosphate gave significant increases in yield at the 3 cwt. rate of application, with further increase at 6 cwt. The most satisfactory response resulted from 6 cwt. of each of these fertilisers in combination when applied with FYM.

P. Mac Giolla Rí.

ONION SETS : TOP DRESSING TRIALS

Nitrogenous Top Dressing

The trial was designed to study the effect of applying nitrogen top dressings to onion sets at rates varying from 2 cwt. to 8 cwt./acre at intervals from May to July. The variety used in the trial was Rijnsburger (heat treated). Statistical analysis indicated that the results of the treatments were insignificant. The nitrogenous fertiliser used was calcium ammonium nitrate. Base dressings of N, P and K were applied in accordance with requirements as indicated by soil analysis.

Varying the Nitrogen/Potassium Ratio

The treatments consisted of three levels of calcium ammonium nitrate, 2, 4 and 6 cwt./acre, and 2 and 4 cwt./acre of sulphate of potash arranged in factorial combination. These treatments were applied, in two stages (a) half total quantity in the third week of May, (b) the remainder in mid-June. Base dressings of N, P and K were applied

in accordance with requirements as indicated by soil analysis.

Statistical analysis indicated that the results of the treatments were insignificant under the conditions of this trial.

P. Mac Giolla Rí.

SPRING CABBAGE NITROGENOUS TOP DRESSING TRIAL

The variety used in the trial was Myatts Early Offenham. The treatments were applied in two lots, half the total quantity in late January and the remainder five weeks later. The crop was harvested in early May and yields are shown in Table VI.

TABLE VI

Treatment cwt./acre calcium ammonium nitrate	Treatment mean yield ton/acre.
0	2.89
6	7.81
12	11.16
18	11.15
25	12.02

Standard error of treatment mean 1.58 ton

P. Mac Giolla Rí.

SPRING CABBAGE: SOURCES OF NITROGEN TRIAL

The object of this trial was to compare the efficiency of four types of nitrogenous fertilisers. The variety, time, and method of application were the same as for the preceding trial. The rate of application was 275.5 lb. nitrogen per acre (equivalent to 12 cwt./acre calcium ammonium nitrate). Results are shown in Table VII.

TABLE VII

Treatment 275.5 lb. N/ac.	Treatment mean Yield ton/acre
Calcium ammonium nitrate	10.74
Sulphate of ammonia	10.83
Calcium nitrate	10.08
Nitrate of soda	10.88
Control	2.57

Standard Error of treatment mean 1.12 tons.

The results indicated that the application of nitrogen significantly increased yields over the control but that there was no difference between the types of fertiliser used. In both trials the nitrogen treatments had a two fold effect. They increased the number of heads suitable for marketing and also the weight of each head.

The results of the 1959, '60 and '61 trials indicated that application of a nitrogenous top dressing at 6 cwt./acre should give satisfactory results.

P. Mac Giolla Rí.

BRUSSELS SPROUTS TOP DRESSING TRIAL

A basal dressing of N, P and K plus 20 tons FYM was given in accordance with requirements as indicated by soil analysis. Top dressings of calcium ammonium nitrate at rates from 0 to 8 cwt/acre were given at intervals from early July to late August. Under the conditions obtaining in 1961 no significant response could be demonstrated in this trial, nor from one where nitrogen and potassium in a 2 : 1 ratio were applied at intervals over the same period.

P. Mac Giolla Rí.

NUTRITIONAL EXPERIMENTS ON CUTAWAY BOG

A series of trials to test the reaction of a number of horticultural crops to varying rates of nitrogen, phosphorus and potassium on cutaway bog at Lullymore, Co. Kildare, was initiated in the spring. The results to date indicate that while proper manuring is critically important in growing horticultural crops, provision of adequate

shelter, peat depth and other factors are also vitally important.

ONION (var. Giant Zittau)

From the time the seedlings emerged the young leaves were continually being damaged by blowing peat and hail stones, consequently, the plants did not bulb satisfactorily and at harvesting the majority of the plants were thick necked and of no commercial value.

In view of the physical deficiencies in the area it was not possible to make a critical assessment of the effect of the various nutritional treatments.

CARROTS MAIN CROP

In this trial yields varied from 1.2 to 17 tons/acre. This indicates that proper manuring is a very important factor when growing carrots on this medium.

Superphosphate at 6 cwt./acre gave a significantly higher yield than that at 3 cwt./acre. There was no significant difference in yield between 2 cwt. muriate of potash per acre and 4 cwt.; 2 cwt./acre appears to be sufficient for satisfactory crop growth. The application of nitrogen, while increasing leaf growth, did not significantly influence root weight.

The quality of the carrots was rather poor. The roots were puckered and wrinkled and a high proportion were also sun scalded. These are factors which would reduce very considerably the value of the crop. Better incorporation of the fertiliser and deeper cultivations may eliminate some of these undesirable features. Generally, however, the results indicated that this crop should do well on cutaway bog. Copper was applied as a basal dressing at 10 lb. copper sulphate/acre.

FRENCH BEANS

Germination was very satisfactory in all plots. However, in plots where phosphorus was omitted subsequent growth was very sluggish. In general plant growth was most satisfactory where 2 cwt. of sulphate of ammonia, 6 cwt. superphosphate and 2 cwt. muriate of potash were applied. In spite of satisfactory vegetative growth and good flower development, yields were extremely poor. As was observed

in relation to onions, over-exposure appears to be a major problem with this crop.

TRACE ELEMENT TRIAL

This trial was designed to investigate the effect of boron, copper, manganese, molybdenum and zinc on a range of horticultural crops grown on cutaway bog. These elements were applied each at two rates, and arranged in factorial combination. A basal dressing of nitrogen, phosphorus and potassium was applied prior to final cultivation.

All the crops used grew reasonably well irrespective of treatment. Analyses of the results however indicated that cauliflowers responded significantly to molybdenum, applied as sodium molybdate at 4 lb./acre. Carrots responded very significantly to copper, while peas were responsive to the manganese treatments. The Brussels sprouts, cabbage, radish and lettuce were not significantly affected by the trace element treatments.

These trials will be continued.

P. Mac Giolla Rí.

INVESTIGATIONS ON HOLLOW STEM IN SELF BLANCHING CELERY

During 1959 and 1960 many commercial crops of self blanching celery were reduced in value through the occurrence of hollowness or pithiness of the stems. Two distinct types of this disorder were recorded:

(a) Genetical or entire hollow stem condition, which is detectable even when the plants are very young; and

(b) Partial hollow stem condition, which becomes apparent as the plant approaches maturity.

In 1961, trials were carried out at Kinsealy, Fermoy and Ballinasloe to determine the influence of manurial treatment and date of harvesting on the development of the partial hollow stem condition.

A basal dressing of farmyard manure (20 tons/acre) and suitable basal dressings of (NPK) fertilisers were applied at each centre, in accordance with soil requirements as indicated by soil analysis. Plants of the variety Golden Marvel were raised as Kinsealy and planted at each centre in mid-June.

The following supplementary dressings (Table VIII) of

fertilisers were applied in factorial combination. N was applied as calcium ammonium nitrate, P as superphosphate and K as sulphate of potash.

TABLE VIII

Level I		Level II	Method of Application	Time of Application
Boron	o	40 lb./ac	Base Dressing Worked into Top Soil	Immediate prior to Planting
Nitrogen	o	4 cwt./ac N fertiliser	Two Top Dressings	
Phosphorus	o	Ratio 7N to 1 P (N at rate as above)	"	(a) Half 3 weeks after Planting out (2 cwt.) (b) Remainder 3 weeks after (a)
Potassium	o	Ratio 1 N to 1 K (N at rate as above)	"	"

Although the plots at Kinsealy and Fermoy were irrigated until the plants were established the summer of 1961 was too dry to support a satisfactory crop and results are reported from the Ballinasloe area only, where crop growth was very satisfactory.

Yield

Statistical analysis indicated that the nitrogen treatment significantly increased yield. The results also indicated that potassium and boron treatments when applied alone, but particularly when combined with nitrogen, had a beneficial influence on increasing yield. The application of phosphorus either alone or in combination with these treatments had the opposite effect. The main effect of nitrogen taken over all levels of boron, phosphorus and potassium are shown in Table IX.

TABLE IX

Mean yield in tons/acre.

Harvesting date	No nitrogen	N fertiliser 4 cwt./ac.	Harvesting date mean
September 7	9.20	13.47	11.33
September 27	14.89	20.34	17.61
October 7	11.77	15.95	13.86

Significant difference for main effect of nitrogen, at P = 0.01 level.

September	7	2.96 tons
"	27	3.48 tons
October	7	3.52 tons

Pithiness

The incidence of the disorder was significantly reduced when nitrogen was applied. The application of phosphorus or potassium alone or in combination, without nitrogen, resulted in increased pithiness in the outer petioles. Application of boron without nitrogen reduced the incidence of the disorder relative to the control. When nitrogen was applied the effect of boron was insignificant.

Date of harvesting

It was observed that with advance in the season after September 27, apart from a decrease in yield, the degree of pithiness increased and the outer petioles developed a soft brown rot.

Further investigations will be carried out in 1962.

Acknowledgment

Our thanks are due to Mr. M. Cregan and Mr. G. D'Arcy of the Horticultural Advisory Service for their assistance in this work.

P. Mac Giolla Rí.

APHIS CONTROL IN POTATOES

Preliminary trials on *Aphis* control in potatoes were carried out with two recently introduced persistent systemic insecticides. In one trial on early potatoes, variety British Queen, the following treatments were compared:

1) Control
2) Phorate (10 percent) at 10 lb./acre at planting
3) „ „ 20 „ „
4) „ „ 30 „ „
5) „ „ 40 „ „
6) „ „ 20 „ on emergence
7) Thiometon (25 percent) at 16 fl. oz./acre.

Treatments 2, 3, 4 and 5 were applied at planting (20/3/'61) the granular phorate being side-band placed 2 inches from the tubers. Treatment 6 was applied when all the potatoes had emerged (6/5/'61) while treatment 7

was not applied until aphids were first found on potato plants in the trial (25/5). *Aphis* counts were made on June 22 and on July 20. None of the treatments appeared to affect the health and vigour of the potato plants nor was emergence delayed. However, the data indicated that the marketable yield was depressed significantly at the 40 lb. rate. The number of aphids recorded (Table I) indicated that phorate was more persistent and effective at the higher rates of application and also that 20 lb. applied on emergence was of particular value. Mean yields are shown in Table II.

TABLE I

Number of live aphids found on a total of 32 plants, *i.e.* 8 plants/plot, 4 plots

Treatments	1	2	3	4	5	6	7
23/6/'61	263	151	98	48	20	7	65
20/7/'61	81	20	17	12	8	6	64

TABLE II

Mean marketable yield of 4 plots (tons/acre)

Treatments	1	2	3	4	5	6	7
Yields	10.59	9.92	9.79	10.30	9.40	10.26	10.47

Sig. difference P 0.05 0.81 tons/acre
P 0.01 = 1.20 tons/acre

In a further trial on maincrop potatoes, variety Kerr's Pink, planted 6/5/'61 the following treatments were compared—

1) 20 lb. phorate (10 percent)/ac. at planting
2) 30 lb. phorate (10 percent)/ac. at planting
3) Menazon (70 percent) dispersible powder applied as 2.5 percent spray to tubers in seed boxes at the rate of 1 lb. a.e. per ton.
4) Menazon at the same rate as treatment 3 but used as a dip.
5) Thiometon (25 percent) at 16 fl. oz./ac.
6) Control.

Aphid counts were carried out on three dates and the number of live aphids recorded (Table III) would seem to indicate that phorate at both rates was slightly more effective than either Menazon treatment. As in the early potato trial no difference in health, vigour and emergence of the potatoes was detected, nor was there any significant difference in yield between treatments (Table IV).

TABLE III

Number of live aphids occurring on 32 plants, *i.e.* 8 plants/plot—4 plots.

Treatments	1	2	3	4	5	6
3/7/'61	17	15	55	33	63	99
28/7/'61	11	6	16	22	14	12
16/8/'61	10	13	17	25	15	32

TABLE IV

Mean yields of 4 plots in tons/acre

Treatments	1	2	3	4	5	6
Yield	13.18	11.49	12.08	12.72	12.67	13.14

Sig. difference P 0.05 = 3.08 tons/acre
P 0.01 = 4.58 tons/acre

J. C. Cassidy.

PEA—CEREAL MIXTURES

With peas grown for the dried pea trade considerable losses often occur at harvesting through staining and *Botrytis* infection if weather conditions are bad. Also the severe lodging which accompanies the ripening of the crop involves much trouble in cutting together with the need for tripods to ensure adequate drying. It was considered that if peas and cereals were grown together much of these problems could be overcome if the cereals would support the peas sufficiently to allow direct combining to take place.

A small observation trial was carried out to explore this possibility in 1961. Rates of 3 and 5 stone/acre of both

barley and wheat were sown together with peas at 10 and 13 stone/acre. On emergence the peas suffered severe bird damage which greatly reduced the pea plant population. However, from observations made during the season even the lowest rate of barley, variety Herta, appeared much too high since the barley tillered extremely well, grew quickly and practically smothered the peas. Barley did not support the peas very well, the peas being inclined to pull down and lodge the barley. Wheat on the other hand did seem to be a more suitable crop for the purpose since it was slower into growth and produced less tillers thus allowing the peas an opportunity to grow. The stronger stemmed wheat, variety Atle, was capable of supporting the pea haulms. In order not to lose the return from either crop both crops should ripen at the same time. To achieve this it would be necessary to sow the wheat at least 6—8 weeks before the peas. This might be done by sowing the wheat in 14 inch rows and drilling the peas later in between.

The use of desiccants on peas may provide an easier solution to the problems outlined and work on this aspect will be carried out in 1962.

J. C. Cassidy.

SELF BLANCHING CELERY PROPAGATION TRIAL

Comparisons were made between March and April sowings at Kinsealy under glass and direct seeding in the field on April 28. None of the outdoor sown plants bolted and while development was a little slower than the indoor sowings results were sufficiently encouraging to suggest further work on the subject.

O. G. Goodman.

CONTROL OF MAGNESIUM DEFICIENCY IN CELERY

Magnesium deficiency had been suspected as the cause of unsatisfactory progress of celery crops in the garden at Johnstown Castle. Consequently, a range of treatments was given to the variety Clandon White planted on May 29. These included three series of 2 percent magnesium sulphate sprays, soil application of dolomitic limestone at 3 tons per acre, magnesium sulphate at 5 cwt. per acre and

magnesium sulphate applied in peat beneath the plants. No treatment gave any improvement in yield or quality over controls. Foliage samples were taken but the results indicated no marked variation in uptake of Mg resulting from treatments.

O. G. Goodman.

DWARF FRENCH BEAN HARVESTING TRIAL

The varieties Contender, Dutch Double Princess, Top Crop, Full Measure, Processor and Refugee (Idaho Strain) were sown at Oakpark on June 14. All varieties were harvested once at what was considered the optimum time for each variety. A second set of plots of these varieties were harvested once eight days after the optimum date and a third set harvested twice. The highest yields recorded in the first pick were 30 cwt. per acre and for the second, 2 tons per acre, but generally yields for the second picking were about 20 percent higher than the first. Where two pickings were done yields were approximately 30 percent higher than where only one was done at the optimum time.

O. G. Goodman.

SPACING TRIAL OF FREEZING SPROUTS

The varieies Irish Glacier and Cambridge Special were planted on May 31 at Kinsealy at a common inter-row space of 2.5 ft. and at varying inter-plant spacings of 1.5, 2 and 2.5 ft.

Results indicate that highest yields of processing sprouts can be expected at the closer spacings. The results are such that it has been decided to do a further and more elaborate spacing experiment in 1962, in which inter-plant as well as inter-row spacing will be varied.

O. G. Goodman.

EARLY TOMATO PRODUCTION — EFFECT OF TEMPERATURE AND COMPOSITION POTS ON EARLINESS AND YIELD

Two varieties, Ailsa Craig and Ware Cross, sown on December 22, 1960, were planted in glasshouse border soil (direct border) and in 9 inch composition pots ('containers') standing on the border. Planting was delayed until the first truss was in flower (March 8). The propagation temperature was 62 F day and night.

Three growing temperature regimes were maintained (1) 62 F day and night (2) 62 F day, 68 F night and (3) 68 F day and night. The truss vibrator was used to aid setting of early trusses. The crop was cleared on August 23. Yields are shown in Table I.

TABLE I

Effect of growing temperature on earliness and yield of tomatoes (Mean of all treatments)

Temperature °F		First Pick	Yield (tons/acre)	
Day	Night		Up to June 15	Total
62	62	May 20	14.2	54.1
62	68	May 6	23.8	57.4
68	68	May 2	26.8	58.3

(At 14,500 plants per acre density)

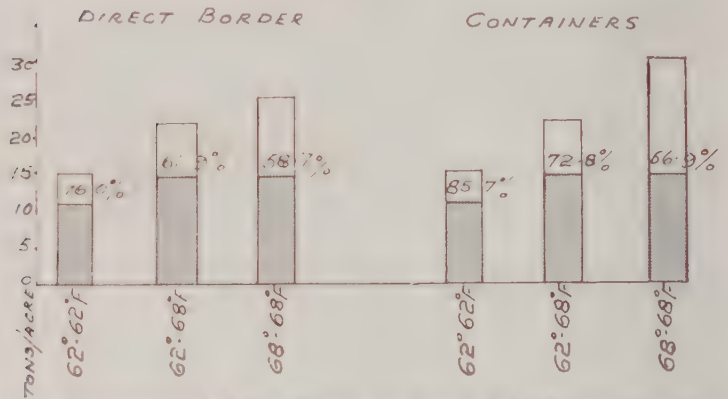
The two higher growing temperatures (68 F day and night, and 62 F day, 68 F night) advanced the date of first pick by eighteen and fourteen days respectively and increased the yield up to June 15 by almost 90 percent, without reducing the total crop.

Both early yield and the percentage of medium sized fruits in early yield were significantly increased at the two higher temperature regimes by the use of containers when compared with the normal direct border planting (Table II).

Ware Cross gave a significantly higher early and total yield than Ailsa Craig in the lowest temperature regime (62°F day and night). At the highest temperature level there was no significant difference in yield between the

TABLE II

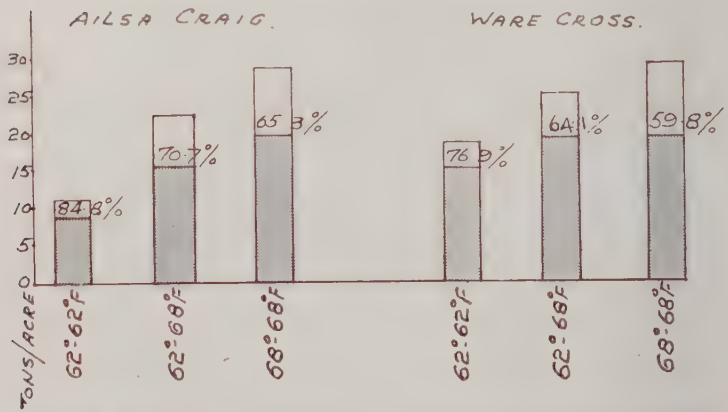
Effect of planting method on yield up to June 15 with percentage medium sized fruits shown by shading. (Mean yield of 24 plots : plant density 14,500 per acre)



two varieties but Ailsa Craig produced a higher percentage of medium sized fruits at all temperature levels studied (Table III).

TABLE III

Relationship between variety and early yield with percentage medium sized fruits shown by shading. (Mean yields of 24 plots : plant density 14,500 per acre)



These findings emphasize the fact that growing temperatures higher than those normally used in Ireland are necessary for early tomato production. On this basis 65°F day

and night would be a good compromise. The use of high temperatures entails the sacrifice of some medium sized and uniformly coloured fruits unless this effect is counteracted by the use of composition pots. At high temperatures Ailsa Craig gave a yield equal to that of Ware Cross, with the added advantage of a higher percentage of medium sized fruits.

M. J. Woods.

EXTENDED SEASON PRODUCTION OF TOMATOES AUTUMN CROP 1961

A study was made on the effects of several factors on the yield and quality of an autumn crop of tomatoes. The factors included were: (1) sowing dates (sown June 8; July 13); (2) varieties (Stonor's Moneymaker, Ware Cross and Ailsa Craig); and (3) nitrogen to potassium ratios in the top dressing (N/K=2/1; N/K=1/1).

These treatments were combined in a randomised factorial design and the whole experiment was conducted within each of the temperature regimes (not replicated) *viz.* (1) 62°F day/62 F night (2) 62 F day/68 F night (3) 68°F day/68°F night.

All plants were grown in 9 inch containers standing on the glasshouse border soil using John Innes Potting Compost No. 3, varying the N/K ratio in the top dressing only.

TABLE I

Effect of sowing date on total yield under 62°F day/62°F night temperature regime. (Mean yields in tons per acre)

Variety	Sown June 8	Sown July 13
Stonor's Moneymaker	11.070	6.506
Ware Cross	11.829	7.715
Ailsa Craig	9.685	7.313

Standard Error ± 0.574
(Plant density 14,500 per acre)

TABLE II

Effect of sowing date on the percentage of medium sized fruits under 62 F day/62 F night temperatures. (Means expressed as percentage of total yield)

Variety	Sown June 8	Sown July 13
Stonor's Moneymaker	91.2	87.7
Ware Cross	87.2	80.6
Ailsa Craig	84.8	86.9

S.E. ± 1.234

Within this temperature regime best results were obtained by sowing on June 8 and using either Ware Cross or Stonor's Moneymaker.

TABLE III

Effect of sowing date on total yield under 62 F day/68 F night temperature regime. (Mean Yield in tons per acre)

Variety	Sown June 8	Sown July 13
Stonor's Moneymaker	11.450	6.734
Ware Cross	12.014	7.516
Ailsa Craig	10.226	7.361

S.E. ± 0.608

TABLE IV

Effect of sowing date on percentage of uniformly coloured fruits under 62°F day/68°F night temperature regime. (Means expressed as percentage of total yield).

Variety	Sown June 8	Sown July 13
Stonor's Moneymaker	76.8	52.3
Ware Cross	84.0	61.5
Ailsa Craig	84.4	44.4

S.E. ± 2.213

The treatments used had no significant effect on the percentage of medium size fruits obtained. Within this temperature regime best results were obtained by sowing on June 8 and using the variety Ware Cross.

TABLE V

Effect of sowing date on total yield under 68 F day/68 F night temperature regime. (Mean yield in tons per acre)

Variety	Sown June 8	Sown July 13
Stonor's Moneymaker	13.218	9.690
Ware Cross	11.942	8.425
Ailsa Craig	11.175	8.951

S.E. ± 0.519
(At 14,500 plants per acre density)

Sowing on June 8 gave a significantly higher percentage of uniformly coloured fruits (87.7 percent) than sowing on July 13 (82.1 percent) the residue consisting chiefly of fruit which had not ripened before the final pick. Stonor's Moneymaker produced a higher percentage of medium sized fruit (92.8 percent) than either Ware Cross (88.9 percent) or Ailsa Craig (89.0 percent) and this difference was significant.

Within this temperature regime best results were obtained by sowing Stonor's Moneymaker on June 8.

Summary of temperature effects :

For the sowing made on June 8 increasing the growing temperature from 62° F day and night to 68° F day and night gave a 19.4 percent increase in the yield of Stonor's Moneymaker, 15.4 percent increase in Ailsa Craig and a negligible increase in Ware Cross. The 62° F day/68° F night temperature regime had an intermediate effect on yield. An outstanding feature in this experiment was the response of Stonor's Moneymaker to the highest temperature regime.

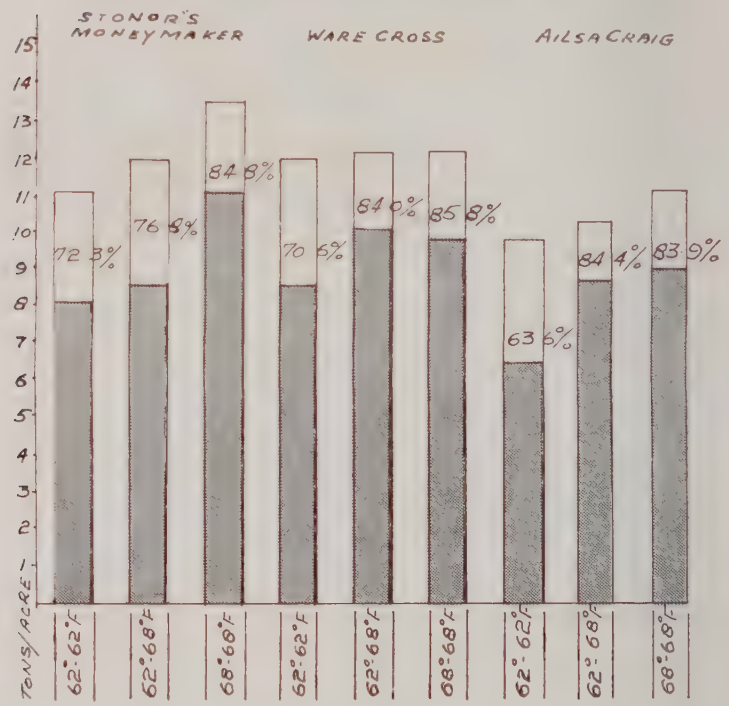
These results are illustrated in Table VI.

No significant effects on size, shape, colour or on total yield were found where the potassium to nitrogen ratios were varied in the top dressing, following either of the two sowing dates or any of the three temperature regimes.

M. J. Woods.

TABLE VI

Effects of temperature on total yield with percentage uniformly coloured fruits shown by shading.



Plant density = 14,500 plants per acre

THE EFFECT OF SHADING AND OF THREE WATER REGIMES ON TOMATOES
(Unheated)

In 1961 three moisture regimes were maintained from the middle of May. In one the calculated amount of water was applied at each irrigation to wet the soil to field capacity when soil moisture tensiometers gave a reading of 7 cm. mercury and in the others when the reading was 14 cm. and 21 cm. mercury. A light shading was applied

to the northern halves of two glasshouses on June 21. The variety used was Ware Cross.

Though in 1960 the unshaded conditions produced a significantly heavier total yield than that obtained by shading, in 1961 there was no significant difference in total yield between the shaded and unshaded halves. This was probably due to the lighter shading used in 1961. Shading produced a significantly lower percentage of medium sized fruits (80.7 percent) than where no shading was applied (88.3 percent)

The percentage of uniformly coloured fruits was significantly greater in unshaded conditions (93.4 percent) than where shade was applied (89.3 percent). While the application of shading material resulted in a reduction in the percentage of greenback fruits, both green blotch and yellow blotch increased significantly. The overall effect of shading was therefore the production of a lower percentage of uniformly coloured fruits.

There was a significant linear effect of moisture tension on total yield. The regression of yield on tension was calculated and a coefficient of 0.66 lb./cm. was obtained. The relationship between total yield and moisture tension may be expressed as follows: $y = 6.9 - 0.66x$ where y = total yield in lb. per plant and x = moisture tension in cm. mercury.

With 7 cm. mercury as the lowest tension used it was found that for unit increase in moisture tension (1 cm. mercury) there was a decrease of 0.66 lb. in total yield. The effect of moisture tension on total yield and yield of medium sized fruits is shown in Table I. Higher moisture tension produced a greater percentage of medium sized fruits. The percentage of large sized fruits was least (11.8 percent) and that of small sized fruits was greatest (2.5 percent) where the highest tension was used.

Periodic tests during the course of the experiment showed that the specific conductivity of the soil solution approximated to 100.

M. J. Woods.

TABLE I

Moisture Tension	Total Yield (lb./plant)	Percent Medium Sized Fruit	Yield Medium Sized Fruit (lb./plant)
7 cm. mercury	6.7	82.9	5.6
14 cm. „	6.6	84.8	5.6
21 cm. „	6.3	85.6	5.4

COLD HOUSE PRODUCTION OF TOMATOES
TIME OF PLANTING

A trial was carried out to investigate the effects of six planting dates on the yield, quality and earliness of two varieties of tomatoes (Stonor's Moneymaker and Ware Cross). The planting dates with their corresponding sowing dates were:

		Sown	Planted
S1	=	Feb. 1	March 30
S2	=	Feb. 8	April 6
S3	=	Feb. 15	April 13
S4	=	Feb. 22	April 20
S5	=	March 1	April 27
S6	=	March 8	May 4

The planting density was 14,500 plants per acre and the crop was cleared by October 13.

Results: The first ripe fruits were recorded on S1 and S2 on June 20 and picking of these commenced four days later. Fruit was being picked from all sowings by July 13. While both varieties were cropping by June 24, Ware Cross (2.6 lb/plant) gave a heavier early yield than Stonor's Moneymaker (1.9 lb/plant). Both planting date and variety had a significant effect on total yield. Ware Cross produced a heavier total yield (7.5 lb/plant) than Stonor's Moneymaker (6.3 lb/plant) and this was true at all planting dates. From Table 1 it is evident that early planting (March 30 or April 6) gave a 21.8 percent increase in total yield over a medium planting date (April 20) and a

53.1 percent increase over the latest planting date studied (May 4). The effect of planting date on the earliness i.e. crop picked before August 10, was also highly significant and is shown in Table I.

TABLE I

Effect of planting date on yield of unheated glasshouse tomatoes.

Planting Date	Yield (lb/plant)	
	Before August 10	Full Season
March 30	3.6	8.1
April 6	3.4	8.1
April 13	2.5	7.6
April 20	1.6	6.6
April 27	1.5	6.0
May 4	0.8	5.2

From these results planting before the middle of April under heated conditions gave a heavier early crop and a 15.2 percent increase in total yield over any later planting. This experiment was carried out on a moderately heavy clay loam which would not be the earliest soil to warm up to the minimum temperature required for planting. Better results would therefore be expected from a light or sandy soil. It should then be possible to supply the market with tomatoes from unheated glasshouses from mid-June.

These are the preliminary results of a single season and must be regarded as tentative.

M. J. Woods.

NUTRITION OF COLD HOUSE TOMATOES
THE EFFECT OF VARYING THE NITROGEN/POTASSIUM RATIO IN THE TOP DRESSING

Six top dressings were given during the season. The normal practice of feeding 2:1 potassium to nitrogen early in the season followed by 1:1 mid-season and 1:2 late in the year was compared with four different ratios of N:K constantly throughout the season. These ratios were 2:1, 1:1, $\frac{1}{2}$:1, and $\frac{1}{3}$:1. Two varieties (Ware Cross and Stonor's Moneymaker) were also included in the trial.

As in the 1960 trial the highest total yield was obtained from the 1:1 (N:K) ratio (Table I). There was also a significant difference in the yields obtained from the two varieties, Ware Cross giving a greater total yield (5.7 lb/plant) than Stonor's Moneymaker (4.6 lb./plant). There was no significant difference in quality between the treatments.

TABLE I

Effect of N : K ratio on total yield of tomatoes grown in an unheated glasshouse.

N : K Ratio	Mean Yield in lb/plant	
	1960	1961
2 : 1	6.1	5.1
1 : 1	6.2	5.7
½ : 1	5.8	4.8
⅓ : 1	5.6	5.1
½:1 — 1:1 — 2:1	5.6	5.0

S.E. for treatment Mean: 1960 = ± 4; 1961 = ± 0.96

The fact that this crop was grown under unheated conditions, when the light intensity was good, must be borne in mind. The experiment is being repeated under heated glasshouse conditions in 1962.

M. J. Woods.

EFFECTS OF CALCIUM, POTASSIUM AND MOISTURE LEVELS ON COLD HOUSE TOMATOES

Using an acid brown earth soil (pH 5.6) of sandy loam texture contained in glasshouse lysimeter plots three levels of calcium were added as ground limestone: 0; 5,000; and 12,000 lb./acre. These treatments were combined in a factorial design with three levels of potassium (lb./acre K added in full season) 500, 1,000; and 1,500 and three moisture regimes. The moisture regimes were maintained by using soil moisture tensiometers to indicate the "critical dry points" which were: 8, 16 and 24 cm. mercury.

The best results in yield and quality were obtained where either no calcium or the lower rate (2¼ tons ground limestone/acre) was used (Table I).

TABLE I

Effect of calcium addition on yield of tomatoes (unheated)
(Mean yields of 45 plots)

Limestone added (lb./acre)	Yield (tons/acre)
0	60.414*
5,000	60.424
12,000	33.285

Plant density 21,780 plants per acre
* Significant at 1 percent level
S.E. = ± 0.170.

At the highest rate of calcium addition (5¼ tons ground limestone/acre) yield was reduced by almost 50 percent, the fruits produced were small and a large proportion remained green at the end of the season. At the highest calcium level the uptake of potassium, manganese and boron was greatly reduced while the manganese content of the leachate increased.

The effect of potassium level was not significant. The yield was similar at all three levels but there was a tendency for the highest potassium level to produce a greater percentage of medium sized fruits. There was no difference in the total yields obtained from the three moisture regimes but there was a significant effect on the size of fruit produced. A moisture tension of 16 cm. mercury resulted in the greatest percentage of medium sized fruits.

Significant interactions between calcium, potassium and moisture were recorded and these are being prepared for publication.

M. J. Woods.

PEAT TOP DRESSING EXPERIMENT ON TOMATO

Using the variety Grower's Pride five rates of peat top dressing were compared: 0; ½; 1; 1½; and 2 inches of peat. All plots received peat as a basal dressing and top dressings were applied when the fruit on the first truss began to

colour. The experiment, conducted under unheated conditions, was planted on May 2 and cleared on October 13.

The total yield from each treatment receiving peat top dressing was greater than that of the control, but there was little difference in yield between these treatments: top dressing reduced the percentage of uniformly coloured fruit. The heavier yield accompanied by a falling off in quality, which occurred where peat was applied, was probably associated with greater moisture availability due to the peat top dressing.

This experiment will be repeated under heated conditions in 1962.

M. J. Woods.

POTASSIUM—WATER RELATIONSHIPS IN POT GROWN TOMATOES

Three levels of potassium and three rates of watering were combined in a factorial design with four replicates and their effects on tomatoes (var. Ware Cross) were studied. The plants were grown in 10 inch clay pots under unheated conditions. The effect of the water rates on total yield was highly significant. The three watering levels were 1½, 1 and ½ pint per plant per day and the yields were 5.3, 4.3, and 3.2 lb. per plant respectively.

There was also a significant interaction between the potassium level and rate of watering, the heaviest watering rate in combination with the medium potassium level in the soil (K 300, Mg 300 lb/ac.) producing the greatest total yield. The smallest percentage of uniformly coloured fruits was from the lowest potassium level.

The rates of watering used in 1960 were reduced in 1961 owing to the occurrence in 1960 of excess manganese in the plants.

The experiment will be repeated under heated conditions in 1962.

M. J. Woods.

MAGNESIUM REQUIREMENTS OF TOMATOES

The variety Ware Cross was grown under high and medium levels of soil potassium in an unheated glasshouse.

Magnesium was (1) applied to the soil (2) applied as a foliar spray (3) omitted. These treatments were combined in a factorial design with four replicates.

The interaction of potassium and magnesium had a significant effect on total yield. Under high soil potassium (Available K = 1,000 lb/ac., S.C. = 160) the greatest yield was obtained where magnesium was applied to the soil. At medium levels of soil potassium (K = 500 lb./ac. and S.C. = 120) the greatest yield was obtained where magnesium was applied to the leaves in the form of a spray (Table I). The available soil magnesium level in the control was 400 lb./ac. while with magnesium application it rose to 650 lb./ac.

TABLE I

Effect of potassium/magnesium interaction on yield of tomatoes (lb./plant)

Treatment	High Potassium	Medium Potassium
Magnesium applied to soil	5.8	5.2
Magnesium applied as spray	4.3	5.7
Control. No magnesium	4.9	4.8

S.E. for treatment mean (lb./plant) = 1.76.

The percentage of medium sized fruits was greater at the medium potassium level (91.5 percent) than where the potassium was high (89.3 percent), while the treatments had no effect on fruit colour.

This experiment will be repeated in 1962 under heated conditions.

M. J. Woods.

TOMATOES—THE EFFECT OF DELAYED PLANTING

The practice of leaving tomato plants in 3½ inch pots until the flowers on the first truss had opened was compared with planting earlier. The first batch was planted when 6–8 rough leaves were showing and subsequent batches were held for a further 5, 10 or 15 days respect-

ively before planting. Two varieties were included (Stonor's Moneymaker and G.C.R.5). No extra nutrients were given to restricted plants.

Sowing was made on January 9 and the first batch was planted on March 20. The experiment was carried out under three temperature regimes: 62 F day and night, 62 F day and 68 F night, and 68 F day and night.

Neither delayed planting nor variety had a significant effect on total yield but the heaviest early yield was obtained where planting was not delayed. There was no significant difference in early or total yields between the two varieties but G.C.R.5 produced a greater percentage of medium sized fruits in all treatments.

It is possible that delayed planting might have more significant effects under shorter day conditions, and further trials are in progress on planting out earlier in the season.

M. J. Woods.

DEFOLIATION OF COLD HOUSE TOMATO PLANTS

Four different rates of defoliation were compared for their effects on the quality, yield and earliness of unheated tomatoes (Variety Ware Cross). The experiment was carried out under shaded and unshaded conditions. There were no significant differences in size, shape, colour or earliness between the four rates of leafing within either shaded or unshaded conditions. Therefore, no evidence was obtained that defoliation assisted early ripening under cold house conditions.

As heating facilities are now available this experiment will be repeated in 1962 using a heated crop.

M. J. Woods.

IRON DEFICIENCY IN TOMATOES (UNHEATED)

Using the variety Stonor's Moneymaker, weekly foliar applications of an 0.15 percent solution of $FeSO_4$ were compared with a 1 inch layer of peat moss impregnated with $FeSO_4$ at the rate of $\frac{1}{2}$ oz. per bushel and with chelated iron applied as a solution to the soil. Three rates of phosphate application were also included: 0; 3 and 6 oz. per sq. yd. superphosphate. The soil P values (lb./ac.)

are shown in Table I. The treatments were combined in a split plot design with 4 replicates.

Slight symptoms of iron deficiency were noted in August in untreated plants, but the iron treatment had no significant effect on fruit size, shape or colour. The effect of phosphate application on total yield was almost significant, yield increasing where available phosphorus was raised to 80 lb./acre, with a further slight increase at 140 lb./ac. (Table I).

TABLE I

Effect of iron and phosphate application on total yield (lb./plant) of tomatoes—unheated.

Iron treatment	Phosphate application with available P		
	Nil (50 lb./ac.)*	3 oz./sq. yd. (80 lb./ac.)*	6 oz./sq. yd. (140 lb./ac.)*
$FeSo_4$ spray	4.9	6.4	6.2
$FeSo_4$ soil	5.3	5.8	6.2
Iron Chelate	4.8	5.9	6.4
No Iron applied	4.6	5.9	6.3

* = Available P.

S.E. phosphate mean = ± 0.589

There was no significant effect of interaction between iron and phosphate application.

M. J. Woods.

PHOSPHORUS—MANGANESE—MAGNESIUM STUDIES IN TOMATO

Studies on manganese toxicity in tomato were continued in co-operation with the Soils Division. Similar effects on soil and plant manganese as previously reported were noted, and magnesium deficiency in the presence of high phosphorus was again demonstrated. Marked symptoms of calcium deficiency appeared in the high phosphorus plots, even where lime had been given. These studies have been the basis of two scientific papers and a third is in preparation.

J. G. D. Lamb.

COPPER AND BORON DEFICIENCIES IN TOMATO

Of considerable interest was the occurrence of copper deficiency in a commercial crop of tomatoes. Affected plants contained *circa* 4—5 ppm. copper in the leaves as against 14—15 ppm. where the symptoms were absent. Healthy plants in another part of the nursery showed 25—44 ppm. copper in the foliage. Immediate improvement followed the application of 23 lb./acre copper sulphate, but repeated applications had to be given to maintain the improvement, so by the end of the season as much as 96 lb./acre copper sulphate had been applied by the grower.

Boron deficiency also occurred in a commercial crop of tomatoes. Response to 20—35 lb. borax/acre was good.

J. G. D. Lamb.

FRENCH BEANS VARIETY TRIAL UNDER GLASS

Object: To study the suitability of six tall and six dwarf varieties of French Beans for autumn production under glass. Sowing was unavoidably delayed until October 5 and consequently the yields were reduced. The first pods were picked from the dwarf varieties on December 11 while the tall varieties were not ready for picking until December 29.

The dwarf varieties Canadian Wonder, Simplo and Masterpiece gave the heaviest yield (Table I) with the Prince and Black Prince yielding somewhat less. Each of these dwarf varieties gave a better yield than Guernsey Runner, the best of the tall varieties. From the average weight per pod it can be seen that while Simplo was among the heaviest yielders, the weight per pod was light. This variety was included because it had been outstanding in field trials at Kinsealy. Under glass it gave a high yield but its small size is its main disadvantage.

From these preliminary results it is evident that the dwarf varieties are more suitable for late autumn production. This experiment will be repeated in 1962 and the sowing date will be advanced to the begining of September.

TABLE I

French bean yields

Variety	No. of Pods	Weight (g.)	Average Wt/Pod (g.)
Dwarf Black Prince	67	138	2.0
„ Masterpiece	87	197	2.3
„ Simplo	156	208	1.3
„ The Prince	75	154	2.0
„ Canadian Wonder	117	248	2.1
„ Tender Green	18	39	2.2
Average	87	164	1.9
Tall Guernsey Runner	44	107	2.4
„ Veitches Climbing (French)	23	51	2.2
„ Kelvedon Marvel	6	16	2.7
„ Blue Lake	9	20	2.2
„ The King	18	38	2.1
„ Princeps	6	6	1.0
Average	18	39	2.1

M. J. Woods.

CUCUMBER CULTURAL TRIAL

Object: To study the effects of three growing media, using two varieties of cucumbers.

The three growing media used were: (1) Straw bales; (2) a 50/50 mixture of loam and FYM; and (3) John Innes Potting Compost No. 3. Varieties: Butcher's Disease Resister and Market Cross, grown under unheated glasshouse conditions in beds 3 feet wide, 18 inches high, the plants spaced at 18 inches. The management of the straw bales was as follows: they were wetted thoroughly before bringing them into the glasshouse; then they were set end to end in a trench 6 inches deep and the 'bed' was completed by adding J.I.P.3 behind and against the straw bales with a thin layer also on top. Calcium ammonium nitrate was

then added in three applications of ½ cwt. each per ton of dry straw, at 5 day intervals. The calcium ammonium nitrate was applied to the surface of the bales and watered in by sprinkling, using a rose. A base dressing of 1 lb. John Innes Base per sq. yard of bed was applied to media No. 1 and No. 2 to raise their nutrient status to that of medium No. 3. Subsequent irrigation and nutrition were similar for all treatments.

There was a significant difference between the yields obtained from the three growing media (Table I) but while the yield from Butcher's Disease Resister (40.1 lb./plot) was greater than that from Market Cross (38.1 lb./plot) the difference was not significant.

TABLE I

Effect of growing medium on yield of cucumbers.
(Means with standard errors)
Planted 30 May; Final Harvest Sept. 26.

Growing Medium	Yield (lb./plant)
Straw bales	15.9 ± 1.26
Loam/FYM	19.8 ± 1.26
J.I.P.3	23.0 ± 1.26*

* Significant at the 5 percent level

These results indicate clearly the superiority of John Innes Potting Compost No. 3 as a growing medium for cucumbers. This significant increase in yield associated with J.I.P.3 is greater than expected and may be explained in part at least by the fact that the base dressing was not applied to the other two media as early as intended. In this way plants growing on J.I.P.3 were given a better start which they probably maintained.

This was the first year in which this experiment was carried out and it will be repeated in 1962. It is expected that with improved management the yields from growing media No. 1 and No. 2 will be increased.

M. J. Woods.

CUCUMBER VARIETY TRIAL

The growing medium used was 50/50 loam and FYM.

TABLE I

Mean yields of 13 varieties of cucumbers (as lb./plant)

Variety	Yield	Variety	Yield
Gallex Sel.	26.32**	President Original	17.94
Butcher's Disease Resister	21.77	Esvier	17.87
Bittex Sel.	21.15	Telegraph	16.03
Spotvrije Sel.	21.15	Spiers	15.74
Green Spot	19.29	Market Cross	14.52
Spottex Sel.	18.63	Spot Free	14.23
		Bitspot Sel.	12.47

** Significant at the one percent level

President Original (0 percent), Spot Free (1 percent) and Bittex Sel. (2.3 percent) had the lowest percentages of "Bents" while the other varieties ranged from 4.4 percent (Telegraph) to 10.2 percent (Spiers). The average lengths of fruit varied from 30.2 cm. (Bitspot Sel.) to 35.2 cm. (Telegraph) with the other varieties having intermediate lengths (mean 33.0 cm.). The average girth ranged from 13.9 cm. (Telegraph) to 15.1 cm. (Spotvrije Sel. and Spottex Sel.), with a mean of 14.6 cm.

M. J. Woods.

LETTUCE—VARIETY AND CULTURAL TRIAL

Object: To investigate some of the factors involved in producing winter lettuce under glass and to compare some newer varieties, using Cheshunt 5B as the standard.

Treatments: (a) Planted at 1st rough leaf stage
(b) „ „ 2nd „ „ „
(c) „ „ 5th „ „ „
(d) „ ex containers.

Sown in J.I.P.2 compost on Sept. 29 (1961) and pricked out as above directly into growing stations spaced at 8 ins. x 8 ins. and grown at 50°–55°F. The preceding crop was

tomatoes. No further fertiliser was applied.

Cropping started at the end of January (1962), the crop being finally cleared on Feb. 6 to make way for the succeeding tomato crop. All plants were not fully developed at this date. The heaviest yield was obtained by planting out at the first rough leaf stage. The use of containers would only be justified if the growing house was not ready in time for early planting.

Varieties: Kwiek, Klock, Kordaat, Proefruin's Blackpool, Nutting's First Early, Cannington Forcing, Cheshunt 5B, Early Paris Market. Of these the first five were the heaviest yielding, all producing heads of similar weight. Cannington Forcing and Cheshunt 5B gave a lighter but earlier (10 days) yield. Early Paris Market gave the poorest yield.

Kwiek, Klock, Kordaat, Nutting's First Early and Proefruin's Blackpool would serve as good alternatives to the standard Cheshunt 5B, being of the preferred medium green colour rather than the dark green of the latter, although they do not form as compact a head during the December-February period.

While the larger varieties made full use of the 8 ins x 8 ins spacing, Cheshunt 5B, Cannington Forcing and Early Paris Market could be planted closer e.g. 7 ins. x 7 ins.

Further trials on winter lettuce under glass will be carried out.

M. J. Woods.

GLASSHOUSE LETTUCE: MOISTURE AND NUTRITIONAL TRIAL

Variety: Proefruin's Blackpool.

Object: To study the effects of three levels of potassium, of calcium and of three moisture regimes on the yield of winter lettuce.

The plants were grown in a lysimeter house, and followed a tomato crop without addition of further fertiliser. The available nutrients in the soil, before planting the tomatoes, were, as determined by the techniques in use at the Soil Laboratory, Johnstown Castle: potassium 400, 800,

1,200 lb./acre; calcium 2,000, 4,000, 6,000 lb./acre.

The calcium level had a significant effect on the weight of lettuce recorded (Table I).

TABLE I

Effect of available calcium level on yield of lettuce.
(Mean yields with standard errors)

Available calcium lb./acre	pH	Yield (g/plot of 4 plants)
2,000	4.2	26 ± 1.9
4,000	4.4	32 ± 1.9
6,000	4.6	43 ± 1.9**

** Significant at the one percent level

Significant effects were also associated with the moisture regimes maintained (Table II).

TABLE II

Effect of moisture regime on yield of lettuce.
(Mean yields with standard errors)

Moisture Regime	Yield (g/plot of 4 plants)
No moisture applied post planting	33 ± 1.9
Soil restored to field capacity when a tension of 8 cm. mercury was reached.	44 ± 1.9**
Soil restored to field capacity when a tension of 16 cm. mercury was reached.	24 ± 1.9

** Significant at the one percent level

These results indicate the importance of avoiding excessive drying out between waterings. The soil used in this experiment was a brown earth from the Dublin-Wicklow uplands, initially of pH 5.6.

M. J. Woods.

CHRYSANTHEMUM : OBSERVATIONS ON VARIETIES

Rooted cuttings of eleven commercial varieties were received on May 18 and were grown on in pots using J.I.P. 2 and 3 composts.

At this early stage in the development of facilities at Kinsealy exposure to wind was a problem despite shelter with hession screens. Shoesmith Salmon seemed especially susceptible, being severely checked, and showing an intense purple coloration of the foliage, persisting for several months. All others showed some marginal leaf chlorosis, except White Indianapolis, which appeared to be a hardier variety.

The plants were not ready for stopping until early July. By this date Woking Scarlet had already thrown early crowns. The plants were segregated into (a) those with and (b) those without break buds. The former budded prematurely and began flowering from 2nd crown buds on short stems in September.

Following severe damage by the storm on September 16, which snapped the main stem of many plants, the plants were housed immediately. Thus as much as one third of the total growth of the late varieties was completed under glass. Where they had been deprived of 1st crown stems, plants produced basal growths giving flowers which sold readily as bunched blooms. This type of recovery was most evident in the Balcombe varieties, in Woking Scarlet and in Shoesmith Salmon.

Despite these setbacks fine quality blooms were obtained from all varieties, with thick stems of good length. The reduced yield per plant encouraged earliness and quality. Top market prices were obtained especially for mid-season blooms.

Notes on the varieties are given in Table I.

The late varieties Fred Shoesmith, Friendly Rival and American Beauty were considered the best commercial kinds having reference to yield and prices obtained.

The extra grade blooms of the Balcombe varieties fetched the highest prices, but their susceptibility to wind reduces the yield, so they are less popular with the grower.

The early variety, Woking Scarlet, looks well under

TABLE I

VARIETY	Storm damage (shoots remaining)	Mean cutting date		Date of 1st. stop	mean stem growth		mean bloom dia. in inches	marketable bloom/20 pots		
		acc. to literature	Kinsealy		total (in ins.)	in house (in ins.)		EXTRA	FIRST	SECOND
White Indianapolis	much (3)	Nov. 5	Nov. 9	July 10	27.2	3.6	4.3		52	17
Woking Scarlet (reflex)	little (3)	" 10	Oct. 24	" 10	23.5	1.5	4.5		23	21
" " (premature buds)	" (3-4)	" 10	" 13	unnecessary	20.6	none	4.5		18	35
Mefo (ivory)	much (3)	" 10	Nov. 27	July 10	32.0	8.0	4.7		69	6
Fred Shoesmith (white)	little (4-5)	" 12	" 27	July 6	29.6	9.0	5.2	66	15	5
Shirley Late Red	very little (6)	" 12	" 27	July 6	24.4	4.4	4.0		37	45
Balcombe Perfection (bronze)	wholesale (2)	" 18	" 22	July 10	24.0	5.6	4.7	25	5	4
Red Balcombe Perfection	wholesale (2-3)	" 18	" 20	July 10	24.8	5.6	5.1	29	3	2
Amber Balcombe Per.	" (2-3)	" 18	" 20	July 10	25.6	5.6	4.6	20	4	5
Friendly Rival (yellow)	little (5-6)	" 20	Dec. 1	July 6	39.6	13.2	4.9	36	24	13
American Beauty (white)	little (3)	Dec. 10	Dec. 10	July 10	28.5	8.6	4.1	17	40	6
Shoesmith Salmon (reflex)	" (3)	Dec. 12	Dec. 10	" 10 (immature)	22.4	9.0	4.4	10	21	8

fluorescent lighting and has possibilities if its flowering can be controlled.

Of the mid-season varieties, the white Mefo and White Indianapolis are notable for their long lasting qualities as cut flowers. Mefo, however, reflexes raggedly as it opens and discolours readily if chilled. Shirley Late Red is notable for its high yield, though the flowers are small and the colour deep.

Shoesmith Salmon is susceptible to blackening of the lower leaves by *Septoria chrysanthi*, not seen on any other varieties in the trial.

Angle Shades moth showed a definite preference for Mefo and Fred Shoesmith, spoiling a number of blooms in mid-November.

J. C. R. Seager.

CHRYSANTHEMUM : MANURIAL TRIALS

All varieties from the previous trial were included in a trial of base dressings at three levels of N:K (1:1, 1:2, 1:3). Five top dressings were also given, maintaining the same proportions of N:K as were given in the base dressings. No differences were noted in vegetative growth or in a yield or quality of blooms in the conditions prevailing in 1961. In view of the common occurrence of magnesium deficiency in commercial crops of chrysanthemums trials comparing addition of magnesium as soil applications and as 1 percent magnesium sulphate sprays were included. However, magnesium deficiency was not a problem at Kinsealy this year.

J. C. R. Seager.

PERPETUAL FLOWERING CARNATION: DENSITY TRIAL

The object of this trial was to obtain data on yield, flower quality and costings, using four different densities of planting: 7″ x 3″; 7″ x 5″; 7″ x 7″; 7″ x 9″.

Nine Sim varieties were planted in a randomised 4 x 4 Latin square design, in mid-July, in permanent beds containing six inches of a compost of 12 parts medium loam, 3 parts peat, 1 part sand. $\frac{1}{4}$ lb. John Innes base fertiliser was added per bushel. Constant liquid feeding started in early December using a constant N:K ratio of

1:1 by means of a carnation trickle irrigation harness. Yields are shown in Table II.

TABLE II

Total Yield per sq. ft. in the first flush (Late Nov.-Late Feb.)

VARIETIES	COLOUR	Spacing			
		7″ x 3″	7″ x 5″	7″ x 7″	7″ x 9″
William Sim	Scarlet	12.7	8.9	8.1	6.7
Sparke's Sim	deep pink with white flecks	16.3	12.1	10.9	7.8
Dusty Sim	deep coloured pink	16.1	10.9	10.1	7.7
Orchid Sim	mauve	7.8	8.2	9.1	6.3
White Sim		12.7	9.1	8.7	6.7
Pink Sim	soft pink	12.1	10.0	9.1	7.2
Scarlet	Red Sim	13.9	11.7	11.0	8.0
Yellow Sim	primrose	10.9	8.7	7.2	6.8
Tangerine Sim	orange	8.7	8.1	8.3	7.0
P = 0.01		1.8	1.5	1.3	1.4

Sparke's Sim and Dusty Sim were markedly early in starting to flower, hence largely the higher yield. Red Sim and White Sim, though also high yielding, were not quite so early.

The peak of the first flush was in early January when 200 dozen blooms were harvested per week (from 6,000 plants). In late February the yield fell to 40 dozen per week.

The results show that most varieties gave maximum yields at the closest spacing. With wider spacing fewer blooms were down graded as ' seconds ' due to weak stems which were particularly liable to occur from mid-January, but the cropping season was shorter.

Results so far indicate that, for winter conditions the 7″ x 7″ spacing is the most suitable. 7″ x 5″ gives little difference in yield, while at 7″ x 3″ the extra yield is outweighed by extra cost and trouble. Orchid Sim, Yellow Sim and Tangerine Sim appear to be unsuitable under winter conditions. However, the results from the summer flushes must be taken into account in the final assessment.

A method has been developed which is promising as a means for measuring the rate of bud development at different times of the year, and hence for forecasting flowering dates.

J. C. R. Seager.

CARNATIONS: INFLUENCE OF SPACING ON CALYX SPLITTING AND QUALITY

Table 111 indicates the influence of spacing on yield and flower quality for a high, a medium and a low yielding variety.

TABLE III

Yield of blooms/sq. ft.

VARIETY	GRADE	Spacing				P=0.01
		7″ x 3″	7″ x 5″	7″ x 7″	7″ x 9″	
Sparkes Sim	1st normal	12.8	9.6	9.6	6.8	2.5
„	„ 1st split	2.1	1.4	1.0	0.8	1.4
„	„ 2nds „	1.4	1.1	0.5	0.2	—
„	„ Total/plant	2.4	3.0	3.8	3.4	first flush completed.
William Sim	1st normal	5.1	4.3	3.9	3.2	1.3
„	„ 1st split	5.6	4.0	3.9	3.2	2.0
„	„ 2nds „	2.0	0.6	0.3	0.3	—
Orchid Sim	1st normal	2.3	2.8	2.3	2.1	1.5
„	„ 1st split	3.0	4.2	5.4	3.5	2.6
„	„ 2nds „	2.5	1.2	1.4	0.7	—

The widest spacing had a significantly lower proportion of split blooms than the closest, but this was outweighed by the higher yield in the latter.

Sparke's Sim and Dusty Sim were the only varieties to show any resistance to calyx splitting. During cold spells of weather up to 90 percent splitting of calyces occurred, especially in Orchid Sim. Plastic clips were considered neater and easier to apply as supports for the broken calyces than rubber bands or metal rings.

J. C. R. Seager.

CARNATIONS: TRIALS ON POT CULTURE

Six different varieties are being compared in pot culture

using J.I.P.2 Compost. A further trial compares different proportions of loam peat and sand, including a proprietary loamless peat-sand compost, using the variety Arthur Sim. Observations include the incidence of nutrient deficiency symptoms. To date earlier production has been noted in the loamless compost.

It was noticeable that plants grown in pots produced, in most varieties, almost straight foliage lacking the curled leaves characteristic of bed grown specimens.

J. C. R. Seager.

FLOWER CROPS—PILOT SCALE TRIALS

Small scale trials were initiated on some flower crops, not at present of major commercial importance, to make observations with a view to possible extension of the work should any appear promising.

Observations on cut *Cypripedium insigne* blooms indicated that changing the water frequently or leaving it unchanged had little influence on the life of the flowers, which lasted up to eight weeks under ordinary living room conditions.

Infection with fungal growth appeared to be a more direct influence on longevity of the blooms, and possible methods of controlling this will be examined. Plants grown in a temperature range of 50°—60° F tended to produce flowers of smaller diameter on longer stems than those grown in an unheated house.

With *Arum* lilies it was noted that there was a direct relation between size of corm and flower quality. Only large corms produced first quality spathes on strong stems, though the flowers from smaller corms were quite suitable for floral work. A trial is in progress on the effect of two summer treatments on yield.

Observations are being made on *Lilium* species capable of flowering within one year from seed, as compared with planting bulbs of flowering size.

Forms and varieties of the hardy *Nerine bowdeni* are being compared, and *Dierama* is being tested as a cut flower.

J. C. R. Seager.

MUSHROOM RESEARCH

The work, which covered a wide field, was carried out in the temporary laboratory at Kinsealy and in the converted cropping houses at Lullymore.

DISEASE AND ANIMAL PEST SURVEY

With the co-operation of the horticultural instructors the disease and animal pest survey was continued. Hundreds of samples were examined in the laboratory; most of the diseases and pests found have been recorded in the Technical Progress Report 1959-60.

A serious disorder which appeared simultaneously in three large commercial farms was brought to our notice. The symptoms of this disorder accorded closely with those of the La-France-Watery-Stipe-Brown disease complex described by Sinden and Gandy. In America this disorder is now being referred to as Disease X; its causes remain unknown. A laboratory investigation of affected material was undertaken. Koole flasks containing agar media were inoculated with the mycelium from 'diseased' compost, but owing to the difficulty of separating the mycelium from the compost fragments, pure cultures were not obtained by this method. Various concentrations of calcium morobiocin and rose bengal failed to suppress the contaminants so that these cultures could not be used for spawn production. Cultures were also prepared from sporophore tissue which exhibited the initial symptoms of the disorder. The mycelium produced showed abnormally slow growth, having an adpressed appearance, unlike the fluffy growth of healthy cultures. Grain spawn was prepared from this mycelium and used in pot experiments in the laboratory. The unfavourable environmental conditions, especially the occasional high temperatures, in the temporary laboratory limited the success of these experiments but sufficient observations were possible to ascertain that the shape of the mushrooms produced deviated from the numerical limits of normality which were achieved in the controls. The results of these preliminary investigations tallied with those of Gandy and served further to identify the disorder, as the symptoms alone do not permit conclusive identifica-

tion, owing to their close similarity to those of mummy and other disorders.

Deirdre C. O'Donoghue.

STRAIN INVESTIGATIONS

Pure cultures of twelve strains of the cultivated mushroom, *Agaricus hortensis* Cook variety *alba*, were prepared The pot experiments with these cultures yielded some useful data, but they were not fully successful owing to the environmental conditions of the laboratory. Further experiments on these lines are under way, under more controlled conditions. Investigation of the techniques of single spore isolation by micromanipulation has also been initiated.

Some technical problems of experimental spawn production were examined. Three varieties of rye grain were tested as growing media. An imported King II variety proved most suitable from the physical point of view. A method of eliminating persistent bacterial contamination in this medium, without 'mashing' the grains was achieved.

A microscopic examination of wild mushrooms collected at Kinsealy revealed that they were truly wild species as they had four sports in the basidia and clamp connections in the mycelia. Cultures were prepared from these sporophores and interesting features of these cultures are being examined.

Deirdre C. O'Donoghue.

CONVERSION OF FARM BUILDINGS AT LULLYMORE

A number of buildings at Lullymore was converted for mushroom production. These now provide a cropping area of 4,000 sq. ft. which will be used for testing, on semi-commercial lines the results from Kinsealy and foreign research stations before recommending them for general commercial application.

The conversion of existing buildings for mushroom growing is rarely so satisfactory as the erection of special buildings for the purpose. However, instructors and people considering entering the business often enquire what state a building must be in for its successful adaptation.

The cropping houses at Lullymore may provide some of the answers.

The thickness of the walls obviated the need for insulation. Their internal surfaces were plastered to a smooth finish, then vapour sealed with a liquid seal and finally finished with a fungistatic and bacteriostatic paint. From the experimental point of view the painting is important, as by this means it is hoped to eliminate the 'tiredness' which other workers have described in mushroom houses which have been in use for some years. Three methods of insulating and vapour-sealing of the ceilings were used; all withstood 'peak-heat' and 'cooking-out' temperatures and it is proposed to test their efficiencies over the years.

For artificial ventilation, galvanised intake fans and perforated polythene ducts were installed. The proportion of fresh to re-circulated air in the houses may be changed at various stages of the culture procedure. Sub-micron filtration of the air is possible and a slight positive pressure is maintained during cropping to exclude unfiltered air.

The first experiments in these houses are at present under way. They are designed to test the uniformity within the houses, the difference between a number of strains, and the effects of three different casing treatments.

Deirdre C. O'Donoghue.

ORCHARD FRUITS

THE CONTROL OF MAGNESIUM DEFICIENCY IN APPLE TREES

These trials were continued from 1960 and the treatments were as follows:—

(a) Dolomitic limestone at 3 tons per acre applied in February '60 and in 1961.

(b) Magnesium sulphate at 10 cwt. per acre applied in February '60.

(c) Foliar sprays of 2 percent magnesium applied at intervals post-blossom.

(d) Control.

The young trees of Laxton's Superb grew exceptionally well in 1961, but foliage samples were not taken owing to the small size of the trees. Girth measurements were again taken. A severe storm in September caused severe premature defoliation in most of the young plantations, as a result of which a leaf-scar infection set in and by November was widespread among the young trees. Work is still in progress on the isolation and identification of this trouble. It will mean that the trees in this particular trial will have to be severely pruned for the second year in succession and some replacements will be needed.

As in 1960 this experiment was carried out also on 19 year old trees of Laxton's Superb and Allington Pippin

Visual symptoms of magnesium deficiency were observed on Laxton's Superb in early July, all treatments being affected except where magnesium sulphate sprays were applied. Allington Pippin was showing no deficiency symptoms this year in any treatment when examined as late as September 8.

Foliage samples were taken on June 1 (before any spray was applied), July 21, August 29, September 22 (after the severe storm). Results are shown in Tables I and II.

Most of the trees in the trial carried good crops but eight trees carried light ones.

TABLE I

Magnesium Content (percent) of Spur & Shoot Leaves of Variety Laxton's Superb sampled at four dates in 1961 (average of 6 trees)

Treatment	Leaf Type	SAMPLING DATES			
		June 1	July 21	Aug. 29	Sept 22
Dolomitic limestone at 3 tons per acre	Shoot	.21	.27	.24	.29
	Spur	.27	.28	.32	.29
Magnesium sulphate 2 percent spray	Shoot	.28	.34	.44	.39
	Spur	.29	.54	.49	.51
Magnesium sulphate 10 cwt. per acre ground application	Shoot	.21	.24	.26	.28
	Spur	.28	.31	.30	.29
Control	Shoot	.24	.29	.35	.32
	Spur	.29	.38	.33	.39

TABLE II

Magnesium Content (percent) of Spur & Shoot Leaves of Allington Pippin samples at 4 dates (average of 4 trees)

Treatment	Leaf Type	SAMPLING DATES			
		June 1	July 21	Aug. 29	Sept 22
Dolomitic limestone at 3 tons per acre (twice)	Shoot	.325	.335	.375	.393
	Spur	.445	.465	.445	.518
Magnesium sulphate 2 percent sprays	Shoot	.305	.395	.465	.475
	Spur	.408	.390	.925	.675
Magnesium sulphate 10 cwt. per acre ground application	Shoot	.295	.345	.385	.383
	Spur	.470	.470	.530	.533
Control	Shoot	.270	.33	.305	.348
	Spur	.383	.423	.445	.515

POST HARVEST UREA SPRAYS FOR APPLE TREES

This trial was commenced in 1960 and was based on work done in Norway. A 4 percent urea spray was applied to six apple trees of the varieties Laxton's Superb and Allington Pippin on October 17, the foliage of which had been damaged by a severe storm just previously. As far as could be judged no damage resulted from the urea application. Leaf samples were taken three times:—

(a) June 2, (1961), to see if the spray in October 1960 had any effect on the N content of the new foliage. No significant increase was noted.

(b) October 17, before spraying.

(c) October 19, 48 hours after spraying.

Results are shown in Table III.

TABLE III

Nitrogen Content of Apple Leaves (as percent of dry matter)

Variety	Leaf type	% N before spraying	% N 48 hours after spraying
Allington Pippin (Average of 6 trees)	Shoot	2.99	3.26
	Spur	2.57	3.23

Shoot leaves increase significant at 5 percent level
Spur leaves increase significant at 0.1 percent level

Variety	Leaf type	% N before spraying	% N 48 hours after spraying
Laxton's Superb (Average of 6 trees)	Shoot	2.80	3.47
	Spur	2.49	3.09

Shoot leaves increase significant at 5 percent level
Spur leaves increase significant at 1 percent level.

J. G. D. Lamb, N. D. O'Kennedy.

MANAGEMENT SYSTEMS FOR YOUNG APPLE TREES

This is a continuation of the trial begun in 1960 in which the treatments were :

(a) Planted directly into existing grass sward with a straw mulch on some trees.

(b) Planted into cultivated ground with straw mulch.

(c) Planted into cultivated ground, area around the trees sprayed with weedkillers.

(d) Control—planted into cultivated ground and given normal cultivations.

The aim was to find out under which system of management did the trees make the best growth.

Varieties

Worcester Pearmain, Laxton's Fortune and Lord Lambourne, all on M.II stock.

Observations

Girth measurements on all trees were taken at a point twelve inches from the union. Severe damage was caused by the storm in September and several trees will have to be replaced. From observations during the year, the growth of the trees in order of merit was as follows:—

(1) Cultivated with straw mulch.
(2) Cultivated normally (Control).
(3) Grass sward with mulch.
(4) Grass sward without mulch.
(5) Cultivated ground with dowpon, simazine and amino triazole being used.

There was little difference between the first three treatments. Growth where weed sprays were used was poor, with Laxton's Fortune very poor.

Trees in these plots also suffered severe damage resulting from defoliation during the storm in September and a number will have to be replaced. The grass plot was kept mown but the clover is apparently being eliminated.

N. D. O'Kennedy.

PILOT TRIAL ON THE USE OF PEAT MOSS AS A STORAGE MEDIUM FOR APPLES

In view of some recent work carried out in Germany on the use of peat moss as an aid to the storage of apples, a small pilot trial was laid down at the Pomology Research Centre, Dungarvan.

In November, as recommended, some fruit was placed in layers in orchard boxes, with a layer of peat on the bottom, and between every layer of apples a layer of fine peat moss was placed, so that each apple was completely surrounded by peat and isolated from every other apple. When full the box was topped off with a layer of peat moss. Most of the fruit was wrapped before being placed in the peat, but some unwrapped fruit was also included.

Boxes were examined in January, February and finally in March. The results were encouraging and in 1962 it will be repeated, bringing in other factors such as stage of ripeness. The fruit in 1961 was very ripe by November and possibly earlier storage in peat would be better under our conditions. A certain amount of shrivelling occurred so moist peat will be tried in future.

The flavour of the fruit remained good throughout and it was very noticeable that no spread of rotting occurred, as each apple was isolated. The only advantage seen in wrapping was that in the unwrapped fruit the peat moss tended to collect in the eye and stalk depressions.

This method would seem an ideal way for storing a small amount of apples.

N. D. O'Kennedy.

OBSERVATIONS ON THE OVER-WINTERING OF THE APPLE SCAB FUNGUS

This work was continued from the 1959–'60 season and the procedure for the examination of the bud scales for infection by the fungus was similar. Buds were taken from ten orchards in January, February and November '61. Of the twenty five samples of fifty buds examined six were infected, the percent infected buds varying from 2—30.

No infected buds were found in January, but infection was seen in February, even on trees where no infection

was detected in January. Nevertheless, early infection of buds was found when sampling was resumed the following November.

No infected buds were found in orchards that had received regular spraying for scab control with one exception, where young trees of Worcester Pearmain showed 30 percent infection of the sample. In this particular case it is thought that the trees did not receive the recommended number of sprays. While the fact that well sprayed orchards were virtually free of bud infection, the opposite did not hold. Some of the orchards sampled had not been sprayed for scab control for many years and were heavily infected with scab in the season prior to sampling, yet no infected buds were found.

Work was also continued on what is considered to be the main source of primary infection, the scabbed leaves from the previous season lying on the orchard floor. Leaves were again stored outdoors in a wire cage and were examined at regular intervals for development of perithecia.

Perithecia containing mature ascospores were found on the leaves on February 25. The perithecia were few but developed rapidly, and ascopores were being liberated in the orchard on March 9. By this date bud burst was already well advanced and was evident in Allington Pippin and Laxton's Superb as early as February 28.

Two automatic volumetric spore traps were in operation in 1961, one was situated in the orchard at the Pomology Research Centre, Dungarvan as in 1960, the second operating in a nearby old orchard that received no scab spraying and consequently had abundant infection. The orchard was only 400 yards from the Pomology Research Centre and it was assumed that similar weather conditions would prevail at both sites, thus the Leaf Wetness Recorder and the other weather instruments were not duplicated. The first ascospores were found on the slides on March 9 and again on March 17, but the main discharge did not commence until March 29. Between this date and May 5 ascopores were trapped on 30 days at one site and on 26 days at the other, the spores being most common during or soon after rain. The main ascospore discharge period

seemed completely finished by May 5 although a few more were trapped on two days in June.

During this period of active discharge of ascospores, conditions suitable for infection occurred on three dates, April 6, 10 and 21, and both Allington Pippin and Laxton's superb were in full bloom for the latter two dates. The first scab lesions were seen in the unsprayed orchard on April 21 and this infection could be traced back to the infection period of April 6.

Conidia of the apple scab fungus began appearing on the slides from both sites on May 8 and were trapped on 40 days between this and July 19 in the unsprayed orchard. In the orchard at the Pomology Research Centre which was sprayed regularly, the catches of conidia were much smaller and less frequent, being trapped on only eleven days during the same period. The heaviest catches of conidia were most common during the hours of daylight. No conidia were trapped at either site before scab lesions were already present in the orchards.

N. D. O'Kennedy.

SCAB WARNING SERVICE—1961

In spring 1961 steps were taken to set up an apple scab warning service on a small scale. This commenced in February when the development of the perithecia on the old scabbed leaves was kept under observation. When ascospores were visible, tests were carried out on the wet leaves and when the ascospores were found to be ripe a general warning was issued that ascospore release could be expected in the immediate future and that a protectant fungicidal spray should be applied where growth was sufficiently advanced.

So that further warnings regarding the occurrence of infection periods could be issued, three centres were set up, where instruments recorded the duration of leaf wetness and temperature. These centres were situated at Mooncoin, Co. Kilkenny; Kilmurray, Fermoy, Co. Cork; and at the Pomology Research Centre, Co. Waterford. It is considered that the information from any one centre would only be valid for a maximum radius of 15 miles from that centre. In 1962 this service will be extended when further centres

will be equipped and the information obtained will be more widely circulated.

N. D. O'Kennedy.

PROTECTANT SPRAYING FOR APPLE SCAB

Captan and Dodine were again used as protectants, with the same number of trees as in 1960. Captan was used at intervals of ten days, while Dodine was applied at ten, fourteen and eighteen day intervals. All spraying was by automatic sprayer and 50 gallons of spray per acre were used throughout. Spraying commenced on March 18.

At picking time the sampling procedure was similar to that used in 1960 (Technical Progress Report 1959-60).

Results of the different treatments are shown in Table IV.

TABLE IV

Fungicide	Variety	Rate of Fungicide per acre	No. of Scabbed fruit per 1,000
Captan 10 day intervals	Allington Pippin	5 lb.	less than 1
Dodine 10 day intervals	„	1½ lb. pre-blossom 1 lb. post-blossom	Nil
Dodine 14 day intervals	„	1½ lb. pre-blossom 1 lb. post-blossom	Nil
Dodine 18 day intervals	„	1½ lb. pre-blossom 1 lb. post-blossom	Nil
Control	„		Controls carried only very few fruit and these were clean
Captan 10 day intervals	Laxton's Superb	5 lb.	5
Dodine 10 day intervals	„	1½ lb. pre-blossom 1 lb. post-blossom	Nil
Dodine 14 day intervals	„	1½ lb. pre-blossom 1 lb. post-blossom	1
Dodine 18 day intervals	„	1½ lb. pre blossom 1 lb. post-blossom	24
Control	„		44

Notes

As can be seen the degree of control in all treatments was excellent. (In 1960 an interval of 21 days between Dodine sprays allowed 8—12 percent infection to develop). Finish of fruit and foliage was very good. Some slight russetting was evident in the Dodine plots but did not take from the appearance of the fruit. Mildew appeared more plentiful on the Captan plot, particularly on Allington Pippin.

That the amount of scab developing on Laxton's Superb control trees was small was probably due to drifting of the fungicides on to them, the 1961 season being noted for the number of windy days. The control trees in the Allington Pippin plots set a very small crop and these few fruits remained clean.

N. D. O'Kennedy.

SCAB CONTROL TRIAL USING DIFFERENT AMOUNTS PER ACRE OF DODINE

This trial was carried out in a commercial orchard of four acres made up of Laxton's Superb with Worcester Pearmain as pollinator. The trees were in their "on" year. Only the Laxton's Superb trees were included in the trial. Each treatment occurred three times in the trial and each plot had ten trees, making in all thirty trees receiving each treatment. Guard rows were present. All spraying was done at 50 gallons per acre applied automatically at 10 day intervals.

Results

2,500 fruit were assessed for scab from each treatment and results are shown in Table V.

TABLE V

Quantity of Dodine per acre	½ lb.	¾ lb.	1 lb.	1¼ lb.	1½ lb.	Control
No scabbed fruit per 1,000	22	12	10	19	7	896

Some slight russetting did occur, but it was not serious and it is difficult to know how much was due to the spray and how much to the weather.

N. D. O'Kennedy.

ERADICANT SPRAYING FOR APPLE SCAB

Infection Periods during 1961 are shown in Table VI.

TABLE VI

Date	No. of Hours of Leaf Wetness	Mean Temp. °F	No. of hours from commencement of I.P.[1] until spraying was done		
			Mercury Programme	Dodine as Eradicant	Modified Dodine
April 6	16	49.7	20	19	20 (Mercury)
April 10	30	50	31	30	31 (Mercury)
April 21	25	50	30	28	28
May 3	16	52	34	32	32
May 31	15	52	38	36	36
June 6	29	54	20	18	18
June 13	24	53	44	43	No spray
July 1	10	61	13	12	12
July 11	48	60	26	25	25

1 = infection period

Three programmes were used:—

(1) An eradicant programme using phenyl mercury acetate

(2) An eradicant programme using dodine

(3) A modified programme using dodine, laid down on portion of the mercury plot.

1. Eradicant Programme using Phenyl Mercury Acetate

This material was tried with good results in 1960, but cannot be recommended for general use on dessert apples. In 1960 the trees received twelve mercury sprays and in 1961 after two applications the trees reacted unfavourably so the number of trees receiving mercury was drastically reduced and the remainder of the plot was changed over to dodine as per programme (3).

Variety—Laxton's Superb.

Results are shown in Table VII.

TABLE VII

Fungicide	Rate per acre	No. Scabbed Fruit per 1,000
Phenyl mercury acetate	2½ lb.	85
Control		44

2 **Eradicant Programme Using Dodine**

Eradicant properties are claimed for this material and as mercury is not recommended for general use it was decided to try dodine. Thirty two trees of the variety Laxton's Superb were used in the trial and the number of hours that elapsed between the commencement of the infection period and the completion of spraying is given in Table VI.

The material was used at 2 lb. per acre in all sprays and a total of nine sprays was applied as against fourteen sprays applied in a routine ten day programme.

Results are shown in Table VIII.

TABLE VIII

Fungicide	Rate per acre	No. Scabbed Fruit per 1,000
Dodine	2 lb.	2.5
Control	—	44

Notes: Some russetting was noticeable, but it was very slight.

3. **A modified Programme using Dodine as an Eradicant after Certain Infection Periods**

This trial was laid down on 29 trees of Laxton's Superb that had already received two mercury sprays and had reacted badly to them. The idea behind this trial was to make use of both the excellent protectant properties and the claimed eradicant properties of dodine. As this plot had already received mercury sprays the results were not reliable, and the programme will be repeated in 1962 from the commencement of spraying. The first spray will be applied after the first infection period that could give

rise to infection, any further infection periods occurring within ten days will be ignored and the next spray will only be applied after an infection period that is at least ten days after the first spray.

With this programme it may be possible to reduce the number of applications of spray required. In 1961 the number of sprays was eight as against nine for a standard eradicant programme and fourteen for a standard ten day programme. This number would have been further reduced to seven if this programme had been in use from the commencement of the season, as no spray would have been applied on April 10, since this infection period occurred within ten days of the previous one on April 6 (Table VI).

Results are shown in Table XI.

TABLE IX

Fungicide	Rate per acre	No. Scabbed Fruit per 1,000
Dodine	2 lb.	40
Control	—	44

Notes: It would appear that the critical period for scab control in 1961 was the early part of April, particularly the infection periods that occurred on April 6 and 10. This plot received mercury sprays after these periods and effective control was not obtained.

N. D. O'Kennedy.

NURSERY

Virus free scion wood of apple, pear and cherry varieties received from East Malling Research Station was grafted on virus free root stocks in March 1961. Trees thus raised were planted out in February 1962 and will become "mother trees" to supply virus free material for further propagation of these varieties.

The first crop of rooted shoots was obtained in November 1961 from the stoolbeds of apple, pear, plum and cherry

rootstocks, originally planted in February 1960. These have mainly been planted as extensions to the original stoolbeds, while a number has been lined out for budding and grafting purposes.

The rootstocks being propagated include:—

Apple: complete series of Malling and Malling Merton Rootstocks.

Pear: Quince A.

Plum: St. Julien A, Myrobolan B.

Cherry: F 12/1.

M. A. Power.

THE MANURING OF PEARS

The object was to establish and maintain medium and high levels of available potassium throughout the soil profile. These levels of potassium were combined with nitrogen at low and high levels.

There has been no noticeable response as yet to any of the treatments which was applied. Tree growth was satisfactory and the variety Beurre Hardy made exceptionally good growth. Nodal canker infection and die-back of the current season's growth became noticeable on all trees during October. The wind and salt spray injury which occurred in mid-September, resulted in the premature-deolifiation of the trees and was, possibly, mainly responsible for the initiation of the infection which gave rise to this shoot die-back. The die-back necessitated the removal of the current season's growth when pruning was undertaken.

Varieties: Conference, Laxton's Superb and Beurre Hardy.

M. A. Power.

THE MANURING OF PLUMS

The experiment was on similar lines to that on pears. In addition a trial was included on the effect of mulching.

There has been no noticeable response as yet to any of the treatments which were applied. Tree growth was very satisfactory and the variety Denniston's Superb did exceptionally well. The trees were defoliated by the storm in mid-September and the current season's growth subsequently developed severe die-back.

Varieties: Victoria, Denniston's Superb.

M. A. Power.

THE MANURING OF SWEET CHERRIES

This experiment has had to be postponed owing to the high percentage of trees which have died due to bacterial canker *(Pseudomonas mors prunorum)*. The trial was laid down in February 1960, one hundred and sixty nine trees being planted, but by September 1961 sixty-seven trees had died. The varieties planted and subsequently infected include:—

Variety	No. Planted	No. Dead
Napoleon	61	27
Gaucher	36	23
Bradbourne Black	36	14
Merton Glory (high worked)	36	3

The Merton Glory trees have made exceptionally good growth and only three trees have as yet become infected. This was the only high worked variety planted.

This experiment will now be utilised as an observation plot for the resistance of the high worked varieties to the disease. Some twenty-five trees comprised of twelve different varieties raised in the nursery at the Pomology Research Centre will be planted in the plot in spring 1962. These trees have been high worked and have been propagated from virus-free scion and rootstock material.

M. A. Power.

THE MANURING OF SOUR CHERRIES

The treatments consist of various nitrogen and potassium

levels in combination. Tree growth has been very satisfactory but no noticeable response as yet to any of the treatments being applied.

M. A. Power.

VARIETY OBSERVATION TRIAL ON APPLES, PEARS AND PLUMS

Tree growth in all sections was satisfactory but nodal infection and die-back of current season's growth were recorded on most varieties in the apple and pear sections. Infected trees had to be severely pruned to remove the diseased areas. This infection was mainly confined to buds and side of shoots directly facing the gale force wind which occurred in mid-September. The premature defoliation of the trees at such an early date facilitated the entry of fungi *i.e. Nectria galligena* and *Gloeosporium perennans*, both of which were subsequently identified on affected shoots. In the plum section most trees showed severe shoot die-back.

M. A. Power.

APPLE PLANTING SYSTEMS

The planting and maintenance costs per acre for the three systems of orchard planting under investigation were as follows:—

System	Planting Cost	Maintenance Cost
Dwarf Bush on M IX (200 trees/ acre). Planted at 12 x 18 ft.	£75 6 0	£10 3 0
Permanent trees with fillers. 200 trees per acre. Permanent trees on M II at 24 x 18 ft. Fillers on M IX—12 ft. apart in the rows	£72 13 0	£10 3 0
Permanent trees, 100 trees per acre, planted at 24 x 18 ft on M II.	£38 8 0	£8 15 0

Cost of planting includes, cost of ploughing, marking out, trees, stakes, ties—cutting and tying.

Maintenance costs includes harrowings, hoeings, spraying, application of manures and rabbit repellent.

M. A. Power.

APPLE ROOTSTOCK TRIAL

The trees made satisfactory growth but suffered similar severe damage to that described under the variety observation trial.

M. A. Power.

PLANTING TWO YEAR OLD APPLE TREES INTO GRASS

The treatments applied included treating the tree positions with sodium methyldithiocarbamate, granulated soil fumigant; mulching the trees with straw, peat and FYM. No response to any particular treatment was noted in 1961. Previous attempts at planting on this site gave poor results.

M. A. Power.

TRIAL ON HOP CULTIVATION

This trial covers an area of $\frac{1}{4}$ acre. 400 sets were planted in rows 7 ft. apart with plants 4 ft. apart in the rows. The Butcher system of training was adopted.

The establishment cost for $\frac{1}{4}$ acre of hops was £152. 5. 0d. and the maintenance cost came to £14. 16. 0d. Total outlay on $\frac{1}{4}$ acre plot during the first season was £167. 2. 0d. This figure includes cost of plants, poles and wire for framework, hop lewing, marking out, and erection of framework. Harvesting costs not included.

Plant growth was very satisfactory, the tallest plants reached a height of 15 ft. 10 ins. during the season, while the average height was $12\frac{1}{2}$ ft. The plants carried a very good crop of cones but these were completely spoiled by the storm which occurred in mid-September. The flowers commenced to open on all plants on August 1 and were fully open from August 10 to 12. Harvesting of the cones would have taken place during the third week of September had not storm damage occurred.

The manurial trial is comprised of:—

(a) the effects of various nitrogen and potassium levels in combination; and

(b) the effects of mulching with peat and straw.

M. A. Power.

GRASSING DOWN TRIALS

Mixtures sown in spring 1961 (per acre)	Area of plot
1) 8 lb. timothy S50 3 lb. red fescue S59 2 lb. white clover S100 1 lb. white clover S184	1¾ acres
2) 4 lb. pure clover S184	1¾ acres
3) 12 lb. timothy S50	1½ acres
4) Tumbledown	1¼ acres
5) Control (continued clean cultivation)	½ acre

The mixture used in No. 1 above gave the best sward establishment and clover take throughout was very satisfactory. The pure clover treatment gave an excellent establishment of clover, while treatment No. 3 contained a high percentage of indigenous grasses in the sward. The relative merits of the various treatments will be assessed over the next five years.

This trial was carried out at the farm of Mrs. E. Foley, Labacally, Co. Cork, whose co-operation is gratefully acknowledged.

DWARF PYRAMID PEAR PLOT

The trees made satisfactory growth and responded favourably to the pruning method adopted. Some maiden trees of the Conference variety showed few lateral growths but produced vigorous central stem extension growth. The two year old trees of the varieties Gorham and Bristol Cross responded very favourably.

Some shoot die-back occurred on all trees but, in general, damage was not serious.

M. A. Power.

PILLAR SYSTEM OF APPLE PRODUCTION

The nine varieties investigated reacted favourably to the initial pruning procedure under this system. Where two year old trees had to be planted instead of maidens the results were quite satisfactory.

M. A. Power.

SOFT FRUITS

BLACKCURRANT : CULTURE ON TILLED LAND

Planted March 1, 1960. Grassing down date: May 27, 1960.

Treatment	Yield (lb./acre)
Grassed down, FYM mulch	1232
Clean cultivated, FYM mulch	1075
Clean cultivated, peat mulch	934
Grassed down, straw mulch	825
Clean cultivated, straw mulch	838
Clean cultivated	715

Sig. diff. (P = 0.05) = 233 lb.

Uniform levels of available soil potassium and phosphorus were maintained as far as possible. P and K fertilisers will be applied each year according to requirements as shown by soil analysis. Calcium ammonium nitrate was given to all treatment at 4 cwt./acre.

Plant analysis in July indicated that in 1961 the FYM treatments gave higher phosphorus and potassium in the foliage than the other treatments. The clean cultivated plants had the highest N level.

For management of the grass a rotary type mower proved more satisfactory than the mower bar type, and a machine with a number of forward gears was better able to deal with strong grass, especially at the edge of the FYM mulch. To deal with the latter a modification of the wheels of the rotary mower gave satisfactory results.

J. G. D. Lamb, T. O'Callaghan.

BLACKCURRANT : CULTURE ON BROKEN GRASSLAND

Opportunity was taken when planting into old pasture to observe the effects of omission of farmyard manure at planting time. The beneficial effects of FYM were marked and the plantation has been turned over to experiments on leaf spot control. Foliage analysis in October 1960 indicated higher levels of P and K where FYM was given, but no differences in leaf nitrogen.

J. G. D. Lamb, T. O'Callaghan.

BLACKCURRANT : VARIETY TRIAL

Planted March 21, 1960.

Variety	Yield (lb./acre)
Baldwin	1245
Blacksmith	1048
Wellington XXX	979
Malvern Cross	944
Westwick Choice	904
Cotswold Cross	867
Daniel's Sept. Black	814
Amos Black	634
Mendip Cross	458
Raven	265

Planting distance: 10 x 4½ feet.

Significant difference (P=0.05) =215 lb.
and (P=0.01) 287 lb.

These are the yields for the first season of cropping only and subsequent performance of the varieties may be expected to vary considerably.

Further leaf samples were taken to study the variation in chemical composition between the varieties.

J. G. D. Lamb, T. O'Callaghan.

BLACKCURRANT: TIME OF APPLICATION OF NITROGEN

This trial, using the variety Wellington XXX, was planted on March 8, 1960. Calcium ammonium nitrate, to a total of 6 cwt./acre in each case, was applied at different times before and after fruit set, before and after harvesting, and in combinations of these times. In 1961, the first cropping year, no significant differences in yield were obtained, except for reduced crops where no nitrogen was applied. The experiment is continuing.

J. G. D. Lamb, T. O'Callaghan.

STRAWBERRY: VARIETY TRIAL No. 1

Planted May 7, 1960

Order of yield in 1961 (lb./acre)

Talisman	12842
Redgauntlet	8879
Cambridge Favourite	7705
Coronation	7013
Merton Princess	6353
Cambridge Rearguard	5807
Rival	5249
Huxley	2074
Senga	248
Sig. diff. (P = 0.01) =	1648
Sig. diff. (P = 0.05) =	1224

In assessing a variety the particular purpose for which it is grown will naturally be taken into account. In general the characteristics, e.g. quality, which have been noted elsewhere were apparent here also. Thus Talisman was outstanding in this first year of cropping as regards yield and is of most acceptable quality for fresh fruit and for processing.

Of the early varieties Cambridge Favourite confirmed its reputation for preferring light soils and Cambridge Rival, a heavy soil variety with solid firm fruit, cropped relatively lightly. Senga was disappointing in being poor in growth and cropping.

Of the late varieties none surpassed Talisman in yield or quality. Redgauntlet produced very large berries of poor flavour. While Coronation produced well coloured solid berries they were frequently mis-shapen. Merton Princess had not the gross vigour noted elsewhere. The fruit of Cambridge Rearguard was of very poor purplish colour and poor flavour. Huxley showed better growth in the higher, drier plots.

It should be noted that Cambridge Vigour, not available at the time of planting this trial, in other experiments showed itself a very fine all round commercial variety,

yielding at least as well as, if not better than, Talisman.

T. O'Callaghan.

STRAWBERRY: VARIETY TRIAL No. 2

In 1961, the second year of cropping, Talisman was again superior as regards yield and quality while Redgauntlet, though this year yielding a good crop, was inferior in flavour, firmness and texture. Cambridge Rearguard yielded less well.

The mis-shapen berries of Redgauntlet noted in last year's crop were not evident this year, though the variety produced many excessively large berries.

J. G. D. Lamb, T. O'Callaghan.

STRAWBERRY: DEFOLIATION TRIALS

Plot size: 1/50 acre (5 replications). Planted: May 12, 1959.

Variety	Treatment	Yield (lb./ac.)
Cambridge Reafguard	Undefoliated	8420
	Defoliated 4/8/60	6650
	,, 16/8/60	5590
	,, 30/8/60	6100
Talisman	Undefoliated	14170
	Defoliated 4/8/60	13930
	,, 16/8/60	13187
	,, 30/8/60	12390
Redgauntlet	Undefoliated	12040
	Defoliated 4/8/60	8480
	,, 16/8/60	9140
	,, 30/8/60	7980

The results show that with these varieties at Clonroche in 1961 no increase in yield followed defoliation, the practice causing a highly significant depression in yield in the case of Redgauntlet (sig. diff. at the 1 percent level = 2,570 lb.) with a similar trend in the other two varieties. No significant difference showed between the results of defoliating at different dates.

T. O'Callaghan.

STRAWBERRY — NITROGEN AND POTASSIUM LEVELS OF NUTRITION

Planted: May 6, 1960. Variety: Cambridge Vigour. Treatments: Calcium amonium nitrate at 1½ and 3 cwt./acre and sulphate of potash at 2 and 4 cwt./acre, in all combinations. Superphosphate was given overall at 5 cwt./acre

No significant difference occurred in the first year of cropping. Similar results have been reported in Great Britain i.e. that using well grown runners, planted in soil prepared in such a way and of such a nature as to allow free rooting, fertilisers had no appreciable effect at least in the first year of fruiting.

Notable was the high yield obtained with this variety, *circa* 7 tons per acre.

J. G. D. Lamb, T. O'Callaghan.

GOOSEBERRY, RED CURRANT AND RASPBERRY

Trials covering manuring, liming, and cultural methods were laid down in spring 1960, but these plantations are not mature enough to yield results of significance.

A variety trial of eight raspberry varieties was planted in spring 1961. Four varieties of red currants were planted for trial.

J. G. D. Lamb, T. O'Callaghan.

MISCELLANEOUS OBSERVATIONAL TRIALS

1. Control of Blackcurrant Leaf Spot.

Four fungicides were tried out according to normal usage *i.e.* TMTD, maneb and zineb from two different sources. These materials were sprayed on five times at approximately fourteen day intervals. The zineb materials, as measured purely visually by leaf retention on the bushes, gave the best control and one zineb material seemed to give better control than the other.

It might be well to emphasise here the not inconsiderable difficulty in getting good coverage of blackcurrant bushes with spray materials. To achieve as good as possible coverage the spraying machine was modified quite simply. Two jets were directed straight at the bush while another two were directed from above down into the heart of the bush and another two set so that, as far as possible,

the spray was propelled from below up into the bush. It was felt after these very simple alterations that as good coverage was achieved as could be expected.

2. Observational Trial on Dodecylguanidine Acetate (dodine) as a Fungicide against Blackcurrant Leaf Spot.

This material was tried out rather late in the season and gave promise of good control of the disease. It was used at 1½ lb. per acre and, even though only applied on May 19, its effect was still visible on October 1. This material will be tried out fully in the 1962 season.

3. A quantity of the loganberry clone LY59 was imported and planted out in preparation for future work.
4. Varieties of strawberries were also imported from the U.S.A., Holland and Germany and planted out to assess their possibilities under our conditions.

T. O'Callaghan.

SOFT FRUIT PLANTING STOCK

Pending the establishment of a scheme which would ensure a flow of healthy, pure planting material to the soft fruit propagators of the country it was decided to propagate the most healthy material available of both black currants and raspberries to supply their demands. The more important varieties were chosen in each case.

During the season, a thorough spraying programme was carried out and at the appropriate times the crops were inspected to detect any disease or pest infected plants as well as rogue varieties.

During the autumn, material from these plantations were made available to the propagators on the Department of Agriculture's official list.

O. G. Goodman.

TRIALS ON BLUEBERRY CULTIVATION

All nine commercial varieties in the trial cropped in 1961, their second fruiting season. To date, Jersey promises to be the most vigorous in growth and the most productive of these varieties.

A first light pruning was carried out on some bushes to encourage growth of young shoots to bear fruit in future seasons. A suitable repellent protected the bushes from hare damage during the winter.

The hybrid seedlings raised from the seed received from the U.S.A. Plant Industry Station made good growth and an occasional plant yielded a few fruits for the first time. Plants with large berries of good flavour were marked for further observation. Seedlings of the Rabbiteye blueberry made good growth and named varieties of this species were received from U.S.A. for trial.

Some of the lowbush seedlings flowered in autumn too late to mature fruit, but individuals with a spring flowering habit were marked for future observation.

J. G. D. Lamb.

TRIALS ON *ACTINIDIA*

The seedlings of *Actinidia chinensis* made vigorous growth and some flowered for the first time in 1961. Of these some were male plants, but a few fruits were harvested from female plants in late autumn and ripened in storage during November and December. Plants bearing superior fruits were noted for future observation.

J. G. D. Lamb.

THORNLESS GOOSEBERRIES

A second crop of fruit was gathered, small in quantity as numerous shoots were removed from the bushes for propagation purposes. A few thorns were noted at the base of the shoots of some varieties. Others were quite thornless.

J. G. D. Lamb.

TRIALS ON MISCELLANEOUS NEW FRUITS

In co-operation with the Peatland Research Centre, Glenamoy, trials are in progress on Myrtleberry, *Myrtus ugni,* as a fruiting plant for blanket bog. Though still small, the bushes fruited heavily in 1961. Seed received from New Zealand was germinated and seedlings are being grown on for more extensive tests at Glenamoy.

Cranberries planted at Glenamoy, after making slow progress at first, are now growing more freely but were transferred to a more suitable site owing to weed infestation which occurred before the plants became sufficiently established to compete. Further varieties are being propagated for trial.

Seedlings of so called rock cranberry grew strongly in 1961 but as yet have not flowered freely. Seedlings of huckleberry, *(Gaylussacia)* also grew well but are not yet mature.

Clones of the trailing *Rubus caesius* with superior fruit were selected from wild plants and planted for observation of their possible value when cultivated. The berries were attractive in colour and flavour. Seedlings were also raised from selected plants for inclusion in the trial.

J. G. D. Lamb.

BEEKEEPING DEPARTMENT

QUEEN FERTILITY INVESTIGATION

The object of this investigation was to find if mating was a factor limiting the fertility of queen bees in Ireland. Since mating can only occur at the beginning of a queen's life, and only in flight, it seemed a likely cause of defects and failure of bee colonies here.

During 1960 and 1961 a total of 226 young queens was mated and dissected. The quantity of semen stored in their spermathecas was measured by haemocytometer counts of spermatozoa samples. Queens mated in the USA and Italy were imported and used as controls. Observations were made on *Nosema* incidence, race of bee, colony type and size of queen to check these as sources of difference.

Effect of Nosema on mating

Ten or twelve worker bees accompanying each queen were examined microscopically for *Nosema* infection to determine what effect a diseased colony had on mating. Results are shown in Table I.

Nosema therefore does not appear to have an important effect as regards mating. It is, however, more likely to have an effect on egg laying. Three queens received from beekeepers were dissected to find out why they had stopped laying were found to be infected with *Nosema* and to have degenerated ovaries. Four queens failed to mate at all and two were found to be infected with acarine disease. Further work is required to determine more exactly the influence of disease on egg production by the queen. If egg production is adversely affected it may explain cases of early supersedure of imported queens known to occur here. Abroad, infection with *Nosema* has been shown to be a cause of supersedure.

L. Feely.

TABLE I

Origin		*Nosema* present	*Nosema* absent
USA (1961)	No. of Nuclei ...	12	13
	Mean no. of spermatozoids per queen (millions) ...	6.34	6.13
Dublin	No. of Nuclei ..	3	11
	Mean no. of spermatozoids per queen (millions) ...	5.41	5.21
Kildare	No. of Nuclei ...	—	16
	Mean no. of spermatozoids per queen (millions) ...	—	4.74
Wexford	No. of Nuclei ...	12	22
	Mean no. of spermatozoids per queen (millions) ...	4.12	3.9
Ireland (1961)	No. of Nuclei ...	49	15
	Mean no. of spermatozoids per queen (millions) ...	4.50	4.38

RELATION BETWEEN SIZE OF QUEEN AND MATING

Since queens and workers are both female, differentiation being produced by variations in diet, it is possible that deficiencies in diet might produce queens tending towards workers in certain characteristics. Dreher in Germany, for example, states that the ability of a queen to mate is limited by her size. Data (Table II) obtained on the weight of 201 queens in relation to the number of spermatozoids in their spermathecas did not show any marked trend. No evidence was found to suggest that heavier queens have higher sperm counts. Weight of queen and hence nutrition during the larval stage can therefore be discounted as a possible factor invalidating the conclusions of the main investigation.

TABLE II

Country of origin	No. of queens	Mean No. of spermatozoa (millions)	Weight (mg)	
			Mean	Range
Ireland	98	4.29	205	153—266
U.S.A.	45	5.44	186	144—258
Italy	28	6.75	205	191—227

The present results indicate that, with regard to mating, there is a discrete difference between reproductive and non-reproductive females. This is in comparison with bumble bee species where difference in weight between reproductive and non-reproductive castes tends to be continuous.

L. Feely.

EFFECT OF CLIMATIC DIFFERENCES ON MATING

A: Seasonal

The seasonal variation in spermatozoid count for 98 queens mated in Ireland during 1960 and 1961 was not great. (See Table III). This result gives some guidance to bee-keepers in deciding whether to replace queens after one or two years.

TABLE III

	No. of queens	Spermatazoa Mean (millions)	Standard error	Significant difference
Ireland 1960	34	3.95	0.24	0.56 (P=0.05)
Ireland 1961	64	4.48	0.16	0.74 (P=0.01)
Difference		0.53		

The age of the queen should not be the deciding factor but the type of season. For instance, queens mated in a very good season, as 1959, are likely to remain productive for two years or more while ones mated in a bad season, as 1958 are liable to become drone layers and depleted of sperm after a year or so.

B: Local

Local variation in climate was allowed for by mating queens in aparies in Counties Dublin, Kildare and Wexford. The results, (Table IV),showed that there was a significant difference between queens mated in Wexford and those mated in the Dublin/Kildare region. Both areas, however, represent above average conditions for mating, having highest sunshine hours and lowest rainfall, and greatest density of drones for the country. Comparisons with wetter western counties would probably reveal differences of much greater importance.

TABLE IV

	No. of queens	Spermatazoa Mean (millions)	Standard error	Significant difference
Wexford 1960-1961	51	3.83	0.18	0.63 (P=0.05)
Dublin 1960-1961	27	4.78	0.29	0.84 (P=0.01)
Difference		0.95		
Wexford 1960-1961	51	3.83	0.18	0.48 (P=0.05)
Kildare 1960-1961	20	4.79	0.22	0.64 (P=0.01)
Difference		0.96		
Dublin 1960-1961	27	4.78	0.29	0.69 (P=0.05)
Kildare 1960-1961	20	4.79	0.22	0.92 (P=0.01)
Difference		0.01		
Wexford 1960-1961	51	3.83	0.18	0.51 (P=0.05)
Kildare/ Dublin 1960-1961	47	4.78	0.19	0.67 (P=0.01)
Difference		0.95		

C: Major Climatic differences.

The effect of the major difference between the Irish and Continental climates can be seen from the results given in Table V.

While the difference in the mean number of spermatoza between Irish and foreign mated queens is in favour of the latter the extent of this difference is better demonstrated from the cumulative frequency distribution of the sperm counts. For example, 83 percent of the Irish mated queens had counts of less than 5 million compared to 36 percent of the foreign mated queens. Most of the Irish queens

TABLE V

		No. of queens	Spermatazoa Mean (millions)	Standard error	Significant difference
Italy	1960-1961	28	6.75	0.34	0.65 (P 0.05)
Ireland	1960-1961	98	4.29	0.14	0.86 (P=0.01)
Difference			2.46		
USA	1960-1961	45	5.44	0.27	0.54 (P 0.05)
Ireland	1960-1961	98	4.29	0.14	0.72 (P=0.01)
Difference			1.55		
USA/					
Italy	1960-1961	73	5.95	0.19	0.48 (P=0.05)
Ireland	1960-1961	98	4.29	0.14	0.63 (P=0.01)
Difference			1.66		
USA/					
Italy	1960-1961	73	5.95	0.19	0.43 (P=0.05)
Ireland	1960-1961	128	4.12	0.12	0.57 (P=0.01)
Difference			1.83		

came into the medium or low range (1 to 5 million) of the frequency distribution while most of the American and Italian mated queens came into the medium or high range (5 to 9 million).

The results show that the Irish queens did not receive optimum matings. This may be due to (a) the tendency for a longer mating period in a less favourable climate, with consequent ovary development reducing the capacity of the lateral oviducts for temporary storage of semen, and (b) a decrease in the queen's ability to fly. It shows also the need for a higher drone ratio in the hive in Ireland to compensate for other natural limitations. This drone population in a hive may consume 10 to 15 lb. honey, a considerable amount compared to the average yield of 30 or 40 lb. per hive.

In summary it may be said that while the major factor influencing mating was the Irish climate as compared to the Continental, other differences such as seasonal and local climate variations have also to be taken into account.

L. Feely.

AMERICAN FOUL BROOD *BACILLUS LARVAE* DISEASE TRIAL

The object of this trial was to test the suphathiozole method of treating American foul brood disease, which is recommended in some countries and condemned in others. The apiary of seven stocks after undergoing treatment with sulphathiozole for three seasons (1959, 1960 and 1961) was still infected with the disease. While there are too few stocks for any strong conclusions to be drawn, a negative result, as in this trial, does give a very strong case against the adoption of this treatment. This disease therefore must be regarded as highly dangerous to bee-keeping.

L. Feely.

MISCELLANEOUS TRIALS

CONTROL OF SCUTCH GRASS

Two trials on control of scutch grass (*Agropyron repens*) were laid down in September 1960 to test the efficiency of herbicides and rotavation treatments. In Trial No. 1 the follcwing treatments per acre were given:

1) 7 lb. dalapon (74 percent)
2) 14 „ „ „
3) 21 „ „ „
4) 28 „ „ „
5) 1 gallon aminotriazole (20 percent)
6) 2 „ „ „ „
7) 3 „ „ „ „
8) 7 lb. dalapon (74 percent) + 2 gallons aminotriazole (20 percent)
9) 14 lb. dalapon (74 percent + 1 gallon aminotriazole (20 percent)
10) Control.

Ploughing treatments were superimposed on these herbicide applications as follows—

A = No ploughing
B = Ploughing 3 weeks after spraying
C = Ploughing 6 weeks after spraying.

All spray treatments were applied when the average height of the scutch was 8 inches and it was growing actively. The results of this trial have not yet been statistically analysed and from observations and records made since the trial was laid down the following points can be mentionad.

1) The mixture of dalapon and aminotriazole gave more rapid kill of foliage than either of these herbicides alone at the highest rates. Treatment 9 gave more rapid foliage kill than No. 8, no trace of green tissues being visible 3 weeks after spraying.
2) Leaf density counts made 7 and 13 months after spraying indicated that no treatment gave complete scutch control. Counts after 7 months showed

reductions in leaf growth as compared to the control ranging from 91 percent for dalapon at 28 lb./ac. to to 65 percent for aminotriazole at 1 gallon/ac. Results of the second count carried out 6 months later showed that the effects of these herbicides was of rather short duration. On this occasion the amount of scutch had increased in 6 months as much as 4 times in some plots, the greater increases occurring in the better controlled plots of the previous reading. The control counts were similar on both dates. Counts after 13 months showed reductions ranging from 50 percent for dalapon at 28 lb./ac. to 32 percent for aminotriazole at 1 gallon/acre. In general there was little difference in scutch control between dalapon at 14, 21 and 28 lb./ac. and the mixtures of dalapon and aminotriazole. Aminotriazole alone at all rates proved least effective.

3) Treatment by ploughing did not appear to have any noticeable effect on the reduction of scutch obtained with any of the herbicide treatments.

In a second trial varying numbers of rotavations at different intervals were compared. The treatments were as follows—depth of rotavation 5 inches in all cases.

1) 3 rotavations at 14 day intervals
2) 4 " " 14 " "
3) 5 " " 14 " "
4) 6 " " 14 " "
5) 3 " " 21 " "
6) 4 " " 21 " "
7) 5 " " 21 " "
8) 6 " " 21 " "
9) 3 " " 28 " "
10) 4 " " 28 " "
11) 5 " " 28 " "
12) 6 " " 28 " "

The first rotavation was given to all plots on 5/9/'60 and rotavation continued during the winter months, the last rotavation being given to Treatment 12 on 6/12/'61. Soil conditions were not always suitable for rotavation but the programme was followed as closely as possible. This trial

was located beside Trial No. 1 and the density and height of the scutch were similar. Whilst the results from this trial are not yet finally analysed the following observations can be made at this stage:

a) The greater the number of rotavations given, regardless of the interval between them, the better the control of scutch. However, control was better with longer intervals between rotavations.

b) When compared with the spray treatments in Trial (1) the rotavation treatments were superior to them, both in short and long term control.

J. C. Cassidy.

BAMBOO CULTIVATION

In co-operation with the Glenamoy centre, trials were extended on *Arundinaria japonica*, the species considered most promising of several tried there. Preliminary trials on harvesting gave encouraging results, the plants regenerating rapidly after being cut down. Trials on the time of planting and on the response to manuring of this species have been initiated, and trials of other species are continuing to determine whether by manurial or cultural treatment they will prove adaptable to conditions at Glenamoy. Plants were transferred from the plots at Johnstown to provide planting material for these trials. Tests on the propagation of *A. japonica* by cuttings gave encouraging results, the basal portion of the cane proving most suitable, particularly where incipient root initials were present.

J. G. D. Lamb.

HEDGING PLANTS ON BLANKET PEAT

Conditions of extreme exposure to wind in conjunction with problems of cultivation on blanket peat make the performance of hedging plants at Glenamoy of special interest. The double form of gorse is proving very successful, and being sterile, cannot become a weed. It is proof against grazing by wandering animals, as are *Olearia macrodonta* and *Escallonia macrantha*. Others doing quite well are *Veronica elliptica* and *Senecio rotundifolius* but these are subject to damage if accessible to sheep. *Griselinia* suffers from winter damage to the shoots and is very attractive to

sheep. *Lonicera* dies back in winter. *Privet, Tamarisk, Veronica traversii, Fuschia, Pittosporum, Prunus cerasifera, Teucrium, Alder* and *Viburnum tinus* have not so far succeeded. *Euonymus japonicus* has grown very slowly, and *Cotoneaster divaricata* is subject to die back in winter.

Phormium tenax is very successful as a shelter plant. Seed from superior fibre strains has been germinated for trial as a possible commercial crop.

J. G. D. Lamb.

RHODODENDRONS AND ERICAS AT GLENAMOY

Various species of *Rhododendron* and *Erica* have been under observation at Glenamoy, as an appropriate type of ornamental plant for the bogland landscape. The larger leaved types of rhododendron tried have not been so successful as some of the dwarfer species, though *R. ponticum* is an exception. It is likely that as the shelter belts mature, a wider range of species will do well. Meanwhile the following small leaved rhododendrons are doing well in beds around the buildings, *R. obtusum macrostemon, R X 'Augfast', R. pemakoense, R. calostrotum, R. Williamsianum, R. impeditum, R. fastigiatum.*

Several other dwarf species have not been successful, including *R. muscronatum, R. racemosum, R. russatum, R. "Blue Tit", R. "John Cairns", R. flavidum.*

Heathers in general have been very successful including *Daboecia, E. carnea, E. mediterranea, E. vagans.*

J. G. D. Lamb.

HERBS

Plantings of peppermint, spearmint and camomile were made at Johnstown Castle on March 27 to observe their progress and to determine the feasibility of their commercial production. All made satisfactory growth and were harvested at the end of August, and forwarded for test processing.

Both autumn and spring sowings of opium poppy failed to germinate.

O. G. Goodman

PLANT GROWTH IN PEAT AND FIBRE CONTAINERS COMPARED WITH SOIL BLOCKS AND CLAY POTS

Tomatoes were used as the plants to test the suitability of a range of peat pots as propagating containers. The trial included pots of Irish, Scotch and Norwegian origin as well as the more conventional containers. Very satisfactory growth was observed in both the Irish and Swedish produced peat pots. All plants were grown on and the crop recorded. Tissue weight was recorded at time of planting, the Norwegian pots giving highest yield and the Irish the second highest. Visually, the greatest differences were noticeable at planting out stage and were practically unobservable about 6—8 weeks after planting.

All pots were tested in both the 3 in. and 4 in. sizes, a standard amount of soil being used for each range of pot size.

O. G. Goodman.

NUTRIENT REQUIREMENTS OF SAND-PEAT POTTING COMPOSTS

A replicated trial was laid down to compare crop response to six rates of phosphorus in a compost of 50 percent sand and 50 percent peat, and a second compost containing 25 percent sand and 75 percent peat. Plants were grown on to planting out stage. A full analysis was made of both tissue and soil at various stages and on completion of the experiment, plant weight was recorded.

Similar experiments were laid down to study the requirements of these soils for nitrogen, potassium and lime, the aim being to examine the possibility of developing a simple peat-sand compost which could be made up easily by the commercial grower and be depended on to produce satisfactory crop growth consistently. Indications to date are that a satisfactory compost would include superphosphate @ *circa* 3 oz. per bushel, sulphate of potash @ *circa* 1 oz. per bushel and hoof and horn @ *circa* 8 oz. per bushel, with ground limestone 8 oz. per bushel. Relatively small differ-

ences were noted between the two ratios of peat to sand tested.

O. G. Goodman.

PEAT AS A ROOTING MEDIUM FOR FRUIT TREE ROOT STOCKS COMPARED WITH SAWDUST AND SOIL

Neutralized *Sphagnum* peat moss, sawdust (1 oz./bushel of sulphate of ammonia added) and soil were compared as rooting media for a range of plum and apple root stocks. The plums were layered and the apples were stooled in the normal way. Observations carried out in the autumn showed that the quantity of roots produced in both the peat and sawdust was approximately twice that produced in the soil. This result held generally throughout all the root stocks in the test. Though approximately the same quantity of roots were produced in both peat and sawdust, they varied in character, those in the peat being relatively numerous, short and succulent, while those in the sawdust were scarce, long and fibrous.

O. G. Goodman.

USE OF *SPHAGNUM* PEAT FOR PROPAGATION OF CUTTINGS

Cuttings of *Hydrangea, Escallonia, Fuchsia* and *Griselinia* were rooted in composts consisting of 50 percent peat with 50 percent fine sand and 50 percent coarse sand, by volume with and without nutrients. These four media were compared with coarse sand only, fine sand only, John Innes Seed Compost and John Innes Potting Compost. Cuttings were inserted in June and when rooted in the autumn were planted in a nursery bed to observe subsequent growth. At planting out time there were slight indications in favour of peat plus sand compost where nutrients were added, as indicated by root and shoot development. However it was considered that the performance of the plants during the coming season in the nursery bed will be a more useful guide in comparing the composts.

O. G. Goodman.

SCIENTIFIC PUBLICATIONS

1. "A case of manganese toxicity affecting a cold house tomato crop"
   J. G. D. Lamb, Irish J. Agric. Res. I, No. 1. 1961.

2. "Some effects of phosphate on leaf composition in tomato"
   J. G. D. Lamb, Irish J. Agric. Res. I, No. 1, 1961.